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A General Advance

THERE is not a department of our national activities which is so full of promise as that which we represent in the pages of this journal.

In our peculiar position as observers we do not limit our interest to sections; it is our duty to have regard to the progress of the whole. And remembering the greatness of the past and studying the developments that are now moving in a hundred directions we reach the unshakeable conviction that what has been is small in comparison with what is yet to be.

Statisticians sometimes edify us with details of the progress that has been made in certain electrical applications, and we justly derive satisfaction therefrom. So far, so good—but let us go farther! We need to be men advancing everywhere with the determination that "in our time"—not in years to come—electricity shall win her way into every place where she can render a better service than is now given by any other agent.

The claims of electricity to make the home a place of rest, of comfort, and of light, and to make industrial production more efficient, need neither restatement nor justification in an electrical journal. But they do need bringing convincingly to the minds of millions of people in many lands, who, notwithstanding all the domestic electrical progress of recent times, have not yet learned the truth.

During the past year our electrical systems throughout the Empire have been at work connecting new consumers—an undertaking with a falling number of consumers would indeed be a curiosity!—and our representative organisations have been at work spreading information to accelerate the rate of extension. Manufacturers of products suitable for application in domestic and power service have been busily designing new apparatus to meet changing tastes and requirements. And in the pages of this issue we, according to our October custom, direct attention expressly to these and cognate matters.

We hope that in this way, and by the publication of various special articles on the headway that is being made in different parts of the Empire; on the movements which are proceeding amongst us at home; and on some of the technical work that is in hand; we shall be not only assisting the trade in pursuing its course more energetically, and edifying our readers generally, but helping to bring about a more rapid development of the industry as a whole.

Fires for All

WHATEVER the ultimate form of electric heating may be, popular prejudice runs in favour of "visible" heat, for the public has not yet been weaned from its attachment to the open coal fire. The electric fire with glowing elements meets this predilection admirably, and, while retaining the "cheerfulness" of the coal fire, does away with its mess, labour, and waste. The so-called "low-temperature" systems of electric heating, with their more generally distributed warmth, may one day supersede the electric fire, but that day is not yet, and the fire has many years of useful service before it. The representative selection of electric fires illustrated in this issue proves that the economic depression has not diminished the fertility of designers and manufacturers. This season, more than ever before, all tastes and pockets are amply catered for, and we feel sure that our retailer-readers will be assisted by our article in the choice of their stocks for the coming winter.

Still the Boiling Plate

IT is a pity that the electric kettle is not "pushed" more as an essential part of the complete cooker. The average boiling plate is still a weak link, which is more than fully compensated for by the kettle. But although the combination is a thoroughly reliable and efficient cooking outfit, which can be offered in competition with the best apparatus of other services, efforts should not be relaxed towards finding a quick-boiling plate which can be installed as an integral part of all cookers. The point is brought home when considering the heavier types of apparatus for restaurants, etc., and it has led to manufacturers advocating combined electric baking and gas or steam, etc., boiling. That will not do. It is argued that the domestic cooker and the heavy article represent two different problems, but the same principle is involved in each case. Unfortunately, there is not available with equal convenience the same practical method of overcoming the difficulty in the case of the larger equipment.

Lighting the Home

We shall raise the standard of home lighting if we look more generally at the matter from the standpoint of the consumer. Large numbers of householders are putting up with lighting arrangements which they would quickly abandon if only somebody were to bring right home to them how easily, and at what a small additional cost, a change for the better could be made. The consumer is less to blame than the electrical industry. As Mr. W. J. Jones says later in this issue, electric light is cheap and we should take advantage of every opportunity to drive this fact home. The householder is looking around to find ways for effecting reasonable economies. Sometimes it will be found economical to spend a trifle more on the lighting bill when the general well-being of the family is at stake. In many a residence a little expenditure upon rearrangement of the installation, a change from antiquated fittings and shading, a more frequent attention to lamps, would result in a brighter, happier and more comfortable home, and is not that worth having even though the price be the sacrifice of something else?

"Ring-main" the Home

ONE of the most profitable schemes ever hit on by the distribution engineer is that involving the ring-main principle. Why should not the idea, with its advantages of economy, simplicity, reduced voltage drop, etc., be extended to domestic installations and the like? A North-country manufacturer who advocates the scheme says that, apart from the prejudice of some supply engineers and contractors, there are drawbacks in meeting the governing regulations, or in interpreting them. The proposition has proved so thoroughly sound "on the mains" that its possibilities in the home should certainly be given the fullest investigation. Application of the scheme would depend on the class of equipment to be supplied in each case, but with the prevailing demand for "outlets" its success would be generally assured.

Canada

As reference is made in one of the articles in this issue to the state of domestic electrical business in Canada, it will be timely to repeat, as we do on the authority of a quite recent communication, that a definitely pro-British attitude exists there at the present time. While a great deal depends upon the British manufacturer's method of attack, if he makes one, it seems certain that he will never have a better chance than exists to-day. Of course, the "Canada First" slogan is popular, but Britain and the rest of the Empire, not the United States, come second. In the manufacture of electric cookers there continues to be a friendly rivalry between Canadian and British producers. This is still an interesting feature of the South African market, where close students of electricity supply report that the Canadian apparatus is still very much in favour. This preference has previously been brought to the notice of our cooking apparatus designers. There is a market for us if we can meet local requirements at the right price.

Our Evenings

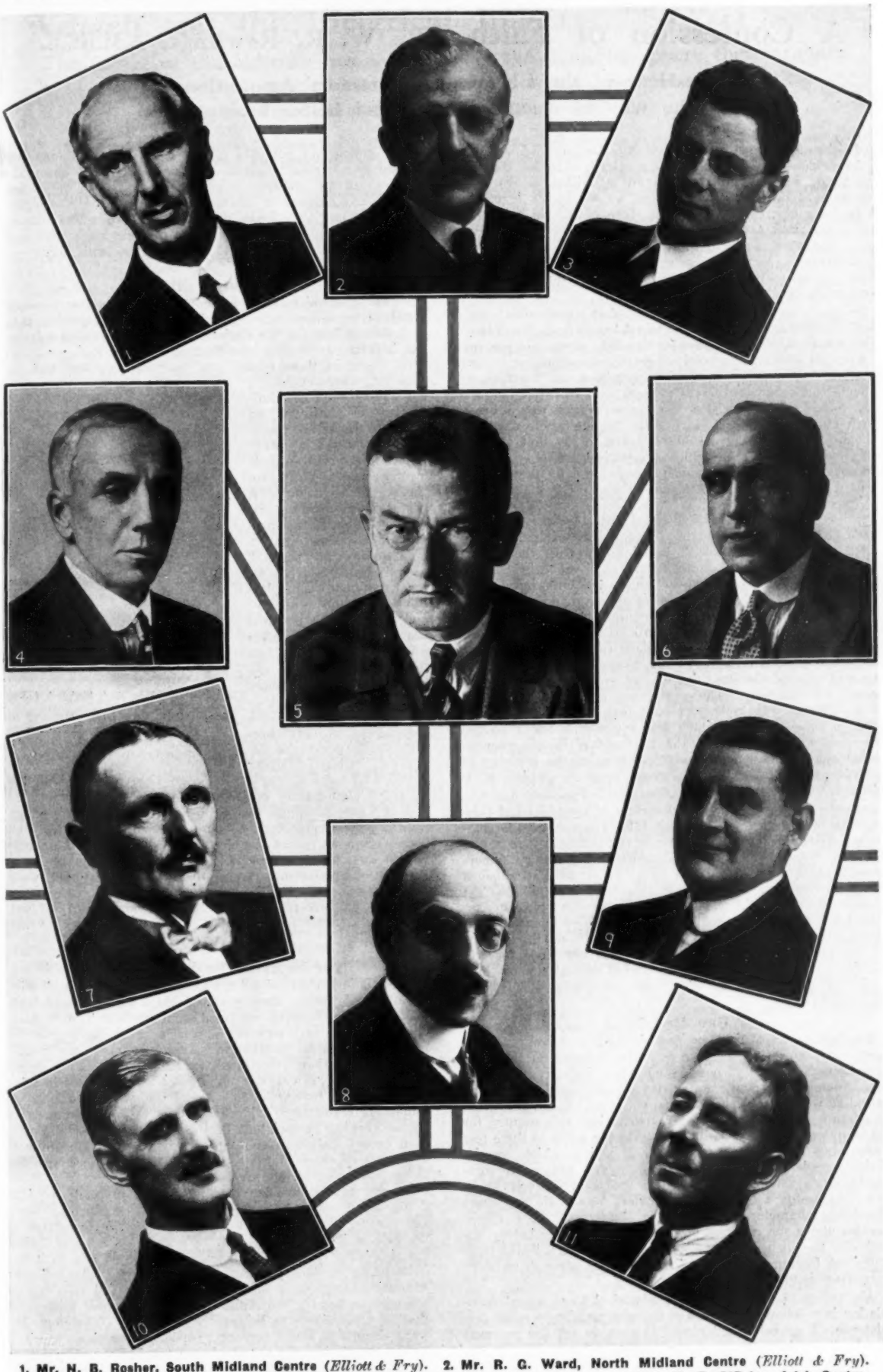
THE announcement of the opening meeting of the I.E.E. next Thursday comes as an annual reminder (if such were necessary) that the "season" for electrical engineers has indeed begun. What Capt. Donaldson has in store for us we cannot tell, but it is safe to prophesy that the serried ranks of members on that evening will not be disappointed. With the splendid impetuosity of youth, the students of the North-East Coast and of the South Midlands will not wait for their elders in London, but will take a flying start a few days earlier than this, as will also a number of the Institution's Local Centres. Actually the first in the field, we believe, was the Institute of Fuel, which, by the way, holds another meeting next Tuesday, when Sir Hugo Hirst, Bart., will deliver his presidential address. Others of the advance guard are the E.D.A., which, as stated in our editorial columns last week, will hold the first of its Salesmanship Conferences to-night. Our engagement book gives us a choice on most evenings during the coming weeks either of alternative intellectual fare or else of social functions, at which important pronouncements are often made.

The Swan Memorial

As stated in our "Notes," £2,800 has been subscribed towards the £5,000 required for the National Memorial to Sir Joseph Wilson Swan, "inventor of the electric incandescent lamp, and a pioneer in the science of photography." The proceeds will be devoted to electrical engineering science scholarships, and an early response to the committee's appeal, completing the sum mentioned, is much desired.

Crane Heating

THE Building (Amendment) Regulations, 1931 (Statutory Rules and Orders, 1931, No. 819. H.M. Stationery Office, 3d. net), which come into force on November 1st, relate to the use of cranes in building operations. The only point they contain of direct electrical interest is the provision of Para. 5 (m) wherein it is stated that "during cold weather the cabin of each power-driven crane in use shall, wherever reasonably practicable, be adequately heated by suitable means." Where cranes are electrically operated the most suitable means that are reasonably practicable are electric heaters. The cranes themselves may provide only an intermittent load, but the heaters will be on continuously while the driver is in his cabin.



1. Mr. N. B. Rosher, South Midland Centre (*Elliott & Fry*). 2. Mr. R. G. Ward, North Midland Centre (*Elliott & Fry*). 3. Mr. P. M. Hogg, Mersey and North Wales (Liverpool) Centre (*Jas. Bacon & Sons*). 4. Col. H. E. O'Brien, Irish Centre. 5. The President, Capt. J. M. Donaldson. 6. Mr. L. Romero, North-Western Centre (*Lafayette*). 7. Col. A. S. Angwin, Wireless Section (*Elliott & Fry*). 8. Prof. G. W. O. Howe, Scottish Centre (*H. J. Whitlock & Son*). 9. Mr. J. Wayne-Morgan, Western Centre. 10. Mr. A. G. Shearer, North-Eastern Centre (*Dickinson, Wallsend*). 11. Mr. F. C. Knowles, Meter and Instrument Section.

The President and other Officers of the I.E.E., Session 1931-32. (*See p. 609.*)

A Confession of Faith. By W. R. Rawlings, A.M.I.E.E.

The President of the Electrical Contractors' Association points the way to electrical unity and better business

IN the achievements of humanity the sublime and the ridiculous are most intimately mixed. If, on the one hand, we contemplate such an exhibition as we have just seen at the Royal Albert Hall we see man's ingenuity at its very best. We secure a picture of human ingenuity and ability that approaches the sublime; but in other directions, and particularly in those by which we order our lives as individuals, as industries, and as nations, we can see, I think, an assembly of human failings which can afford us no pleasure to recall.

On many occasions I have thought that we electrical engineers might draw a most useful moral lesson from the ordered equipment with which we are surrounded. From the generating station to the consumer's apparatus everything must, and does, work together with absolute precision and harmony to provide the beneficial service we seek to give. Without this electro-mechanical precision the entire service would break down and become a useless thing. In the whole electrical scheme of things it is the simple truth to say that there is only one doubtful factor. In this electrical assembly the one unknown and uncertain quantity is provided by the oddities of man himself.

The Unity of the Industry

We hear references from time to time, for example, to so-called electrical "interests." I claim, however, that divergent electrical interests simply do not exist. The industry is divided into sections, not into "interests," and until those sections work together with the same harmonious precision as is exhibited by the electrical equipment for which they are individually responsible, just so long will complete success continue to elude our grasp. As electrical engineers we have one interest and one interest alone, namely, the smooth working and ordered development of our great industry for the benefit of humanity. The equipment before our eyes sets us the necessary example. Every human element in the electrical scheme of things which sets a personal, and therefore momentary, "interest" in the forefront of its programme, rather than the true and central interest of the industry as a whole, thereby betrays the great cause to which it is pledged.

In my earlier experiences as president of the Electrical Contractors' Association in 1904 and 1914, I found myself compelled to indulge in almost continuous fighting in support of the very existence of my own section of the industry. Others were fighting me; we were all fighting; we were all engaged in an exhibition of one of humanity's "major stupidities." I gladly acknowledge that on my return to the presidency in 1931 I am not called upon to indulge in the exchange of such free and hearty blows. But all the leaders in all the sections of our industry know only too well that the scope for still further co-operative work, the scope for mutual support in a policy of real and united electrical development, is at least as great as ever.

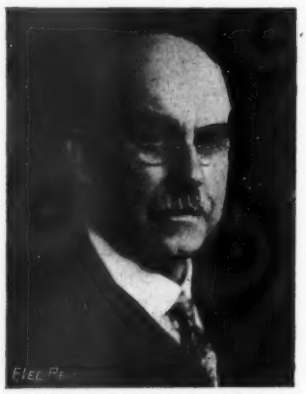
"Buy British!"

Furthermore, real business progress begins at home. It is within our power to organise our own industry on the most enlightened lines, but outside our own industry, and certainly outside our own country, we are compelled to take the world as we find it. The national policy which has permitted the free import of manufactured articles into this country for so many years past is, perhaps, outside the scope of these few notes; but the policy—or the lack of policy—which permits British traders and buyers to supply and acquire foreign-made goods when superior British articles are freely available, represents a folly of the greatest magnitude and most damaging character. To set the "interest" of any one section above the common good of our trade is to betray the industry to which we are personally attached. Deliberately to purchase foreign goods in order to achieve some momentary advantage is to betray our country itself.

My policy as president of the Electrical Contractors' Association is to follow these lines of thought with unswerving persistence. I appeal to all electrical men to set the common good of our industry, and the general progress of our service, above all other considerations. No one section of the industry can advance at the expense of an allied section without serious and unnecessary damage being done to the whole. Secondly, I would make a wholehearted appeal on behalf of the all-British ideal. From a personal experience extending over a good many years, and from an inner conviction that I find difficult to put into words, I know that, to-day, we British people must support ourselves. We must encourage our own British workpeople and our own British industries. To give any measure of unnecessary support to the foreigner is to sign our own death warrant as a productive nation. With that document signed and put into execution, our own great country simply ceases to exist—and we with her.

Beginning at Home

In this particular issue of the ELECTRICAL REVIEW I would conclude by addressing a special appeal to all electrical men and women both on the engineering and commercial sides of the industry to exhibit wholehearted faith in their own service. Save in those areas, now comparatively few and far between, where current is not available on economic terms, the continued refusal of electrical people to make substantial use of the electric service in their own homes—not, of course, for lighting purposes only—provides us with yet another example of human short-sightedness. Only by personal use of the service are we in a position to appreciate its beauty and economy; and only by such personal use can we turn ourselves into convincing salesmen in our approach to the non-electrical public. Every electric house that is set up represents the best possible advertisement of the service to the general public. Every friend who visits an electric home goes away with his or her electrical appreciation enormously increased.



[Photograph by H. J. Whitlock & Sons

Mr. W. R. Rawlings was one of the founders of the E.C.A., and is now president of the Association for the third time

It is a case of killing two birds with one stone. By adopting the service ourselves we secure our own domestic ease and comfort and we spread the electrical gospel among the people to our own business benefit. At the present day no trade effort is of greater importance than this educational work among the people. Public education has reached a point when guidance by precept is automatically ignored and refused. Example, and practical example, is the only thing that will win the day.

The Necessity for Simplification

There is just one final point upon which I would dwell with the utmost brevity. Broadly considered I am convinced that, in the very near future, electrical engineers will have to exercise themselves very seriously indeed in order to simplify the prevailing domestic installation. As a member of the I.E.E. Wiring Regulations Committee, I shall be told that it is my business to get on with the job and not to waste time in talk; but in such a matter as this I feel that we must look for somewhat revolutionary ideas to come as a consequence of the awakening of members of the industry at large, rather than expect their spontaneous generation within the limits of a committee designed to steer a safe and middle course between somewhat widely divergent views.

On the present occasion I do not intend to be drawn into a discussion, possibly rather acrimonious, concerning ways and means. I will content myself with a simple outline of the case in its broadest aspect. We must, as I see it, follow the simplicity of the gas service, and we must add to it the outstanding convenience of the electric service. An ordinary domestic apartment or house of a given size and type can be assumed to have a maximum power of electrical absorption that is never likely to be greatly exceeded. Therefore, we want circuits of larger carrrying capacity than those specified by the Regulations for the maximum number of utility outlets for all purposes. The commonsense fusing of the individual outlets is a simple matter and should be so arranged that each outlet is fitted with an enclosed calibrated fuse available for the personal use of the consumer. In this general arrangement we shall have increased simplicity, lower costs, adequate security and protection for each current-consuming device.

Women and the Electrical Industry. By Vera Norvick

The future of the industry lies so largely in the domestic sphere that intimate knowledge of the art of running a home is an essential qualification in canvassers and demonstrators

WHY are so many women and girls entering the electrical industry, and why are there so many more who wish to enter it?

It cannot be because the remuneration is on an exceptionally high level, nor can electrical work in any way be called a "cushy" job; in many cases it has not even the attraction of a pension, for a large percentage of women engaged as demonstrators and showroom assistants are not included in superannuation schemes. Wherein, then, is its attraction?

The work they have to do is not only varied, but it possesses constant human interest. Its many-sidedness and the ebb and flow of material with which they have to deal give full chance for the development of the workers and in addition there is the interest of the technical side of the work.

"All Sorts and Conditions"

It is but natural, therefore, that all sorts and conditions of women enter a profession in which personality is of paramount importance. We find in it, in the first place, the cultured woman of the world, who, considering things of the home worthy of her best endeavours, and realising the value of scientific methods of housekeeping, welcomes the advent of electricity with all its possibilities. With her trained mind and clear understanding she is sympathetic even to the least receptive of her clients, who has to be shown many a time which switch is which. At her demonstrations she does not show any undue agitation if the lamp does not light when she is showing off the beauties of a new shade; or if the usual small cakes intended to accompany the cup of tea at the cookery demonstration come out flat. This woman is successful because she is efficient and truly interested, and regards her work as a part of the general movement towards better home conditions.

Then there is the homely woman who first entered the electrical industry because she found a job that she could do there. Her sympathies with the working classes and her practical experience help her to appreciate their need for economy.

The attractive, good-looking "womanly" woman finds a place, too. She is gifted with charm and quick wit, and knows human nature even better than she knows electrical appliances. She may be called upon to placate the irate master of the house who is clamouring to have the cooker removed. After an interesting conversation in which the cooker has played but a very small part, she leaves with an invitation to call again; the difficult question of the cooker has been left in abeyance.

New Entrants

The junior posts are filled by girls whose interest in the first place lies in cookery as an art. These come mainly from the Domestic Science Colleges and Polytechnics and find a practical use for their training in the electrical world. Here, in addition to their cooking pursuits, they can develop their interest in the wider applications of electricity to the domestic sciences.

There are, likewise, just a few with a real bent for engineering who, having qualified, are engaged in practical engineering and contracting work; there are, further, some budding women engineers in training at the moment.

The second reason for entering the profession lies perhaps in a paradox; domestic electrical development is at once revolutionary and conservative. Despite the popularity of jazz and the talkies, the charm of tennis and golf, the fascination of motoring and flying, the chief interest of the average woman centres in "home." But, as in all other directions, there have been changes, and the "good old-fashioned home" does not content the woman of to-day. In the strain and stress of modern life she not only wants, but needs, more leisure. Human labour for domestic work is not easily obtained and the home must be kept going. She is aware that electricity can materially help to give her this leisure, that it is the power which will revolutionise the home as it has already revolutionised industry, but a natural fear of this unknown force has prevented her from taking full advantage of it.

The entry of electricity into the home means the elimination of drudgery, and as a career electrical development affords variety and scope. What more natural than that women should welcome it as a profession? It is work that they can do—to show by practical demonstration that using electrical appliances does not necessarily mean getting electric shocks.

Varied Experience

Once she has entered the profession, the demonstrator or the showroom assistant is rarely disappointed, for the work which promised so much proves to be full of vital and absorbing interest. The day's work brings all kinds of experiences, some of them of an unusual nature.

Among the clients called upon by a demonstrator was a woman who could not understand her bills and she was always wondering whether it would be worth her while to change from the flat rate to the two-part tariff. After several attempts to explain the mysteries of the special domestic scale, which was based on lamp wattage, the demonstrator succeeded by going through every room in the house from attic to cellar, armed with notebook, pencil and a step-ladder. Exact calculations were made of the standing quarterly charge on the lamps then in use over a period of a year. By means of comparisons of the bills the client finally saw "light" and spent on other appliances what she eventually saved on the "juice."

[Photograph by Vaughan & Freeman.

Miss Vera Norvick, as Assistant Secretary of the E.A.W., is in close touch with the women workers in the supply industry

Another demonstrator's experience is worth recording. While measuring up the length of cable required for a cooker installation on the second floor she found the service and meter were in a cellar underneath a shop window. She was led to a trap-door between the counter and the window, which, when opened, disclosed a perilous step-ladder. There was no electric light fixed in the cellar and the only illumination provided was a candle, dropping grease continually. After risking life and limb, the meter position was reached and the necessary measurements taken.

What Do They Become?

But what becomes of all the women and girls who enter the electrical industry? In a profession like this, where until very recently there was no recognised qualification or training, there is naturally a certain amount of weeding out, but on the whole those who enter it stay in it. It is work that makes a particular appeal to women. It satisfies the instinct of single women for "home"; it is the one profession which successfully combines the interests of marriage and a career, for the career is the home and the home is the career. There is no divorcing of interests or clash of conflicting sympathies; these women, having an all-electric home, find leisure to continue their careers and manage home and husband, too!

The ambitious showroom assistant, keen on any particular aspect of her work, can by dint of specialisation become an authority on, say, modern illumination, and an interesting career opens up to her equally as an adviser to architects and to the woman who is considering new shades during her spring cleaning. If she is more interested in the selling side, she may work herself up to the position of buyer in the electrical department of a large store.

The junior demonstrator after she has had some experience in the showroom, assisting at the cookery or laundry demonstrations, and visiting consumers in their own homes, can rise to a senior position, where she undertakes lectures and demonstrations on her own account, leading perhaps to her having control of a large area which is either being or may require to be organised and developed with the help of a staff of assistants. In rural areas, where some knowledge of agricultural questions is necessary, she may become an indispensable factor in the life of the community.

A woman entering this profession has the satisfaction of knowing that she is doing work which is peculiarly fitted to her. Though her main purpose is a technical one, she serves a wider object by giving advice on all matters connected with the home. No man can do this so well; the profession is exclusively her own. Her value to the electrical industry is a matter beyond dispute, and no supply undertaking or electrical shop can afford to be without its staff of women.

The Lighting of the Home. By W. J. Jones, M.Sc.*

Beauty, comfort and convenience obtained electrically

THE prosaic way of specifying one ceiling point and one plug point for a room in a house, is a reflection on the imagination of the electrical industry, and what is more important, it compels most householders to lack lighting decoration and comfort and to put up with inconvenience which could have been avoided.

There are so many luxuries in lighting which can be provided quite inexpensively that we marvel at the hesitancy on the part of the public to avail itself of such obvious advantages to comfort and convenience. The blame is largely to be laid at the door of the electrical industry, because, although we are doing a great deal by way of education, our efforts are still insufficient and lacking in co-ordination, while only too frequently the individuals mostly in contact with the consumer have neither the enthusiasm nor the imagination to sell these lighting ideas.

Effect *v.* Efficiency

Quite early in these notes I wish to face the issue whether the usually accepted standard of efficiency in lighting represents a " yardstick " of satisfactory performance. In these days of cheap electric lighting (for electric light *is* cheap, and we require to take every opportunity of driving this fact home to the public), there is no excuse for using inefficient lamps, or for underlighting a room in any way. The question, however, of using the light to the best advantage for domestic purposes is one which defies precise definition; this is equally true in other lighting applications, but is less obvious. The new tendencies in architecture make lighting much more intimate, while in addition electric lighting provides a unique method of giving colour and decoration, and the manner of its use can reveal the taste and understanding of the occupants.

From the nature of a man's library you can gauge his character, and similarly, the switching on of lights in a home unfolds the character of the household: whether practical, possibly revealed by the proper placing of switches and lights for convenience; whether a streak of meanness or ignorance induces apparent saving by underlighting to the detriment of eyesight preservation; or whether the owner, by careful selection of lighting arrangements engenders an atmosphere of prosperity, and shows alertness to progress. Carefully chosen harmonies of light and shade, hue and tone, which form the ensemble of the lighting scheme, may express the depth and quality of artistic feeling.

Because the question of personal taste enters largely into any consideration of the subject of home lighting, there is one feature which governs the selection of lighting, namely, that it should be appropriate to the room it serves. I can conceive of hardly anything worse than a stereotyped fitting used throughout, for it is the change in different parts of the house which makes it a home and not an institution.

The Lounge

For this reason the lighting in the lounge should be in keeping with its purpose of relaxation and recreation. Brilliant overhead illumination is not needed, but ample provision must be made to facilitate reading, sewing, and writing. Expensive artistic hangings can so easily be marred by lighting which does not harmonise, and it is unfortunate that in many instances the character of the room is spoiled by an inadequate silk or glass shade dangling on a piece of flex. Instead of relying on ceiling pendants, there is a tendency, even in quite old buildings, to provide well-diffused light free from shadows by applied cornices of the semi-direct or indirect type, or by discreetly chosen ceiling fittings. Portable lamps are an absolute necessity in the lounge, and if shades are chosen with care, they help to furnish the room far better than the customary vases and ornaments to be found in so many houses. In lighting the lounge you are paying not for lighting alone, but also for a most effective decorative scheme. An illuminated niche in a corner of the room lends a note of distinction and originality which visitors will always remember, while window curtains can be greatly enriched if lighted by coloured lamps from the pelmet.

The Garden

England is renowned for her gardens, but comparatively few of us in these days get opportunity of full enjoyment of them; we are at business all day and during the greater part of the year it is dark before we get home. Now that floodlighting has become a household word, why should we not use this application of electric light, and thus permit their beauty to refresh us after the day's toil? Immediately the lights are switched on, the black windows are replaced by the lighted landscape, and have the effect of increasing the size of the room. The floodlights should be placed on the ground against the outer wall of the house, concealed by a dwarf wall, or mounted just under the eaves. Two 300-watt or 500-watt floodlights will cover the small garden quite well and will cost but a few pence an evening.

Exterior lighting gives the home a bright new " atmosphere "

Other Suggestions

Here are some suggestions for other parts of the house, representing features which can be included over and above the lighting ordinarily provided and which will impart distinction, novelty, convenience, and decoration according to its purpose.

In the festive lighting class, use should be made of decoration lamps for parties, and at Christmas time as lighting features on the table, on the walls, and temporarily round the windows or doorway. They add a quota of cheer and good will.

In the nursery an amusing luminous ornament in the form of an animal or bird will appeal to any child, and provide a safe, convenient, and economical nightlight.

Special shaving mirrors are now obtainable made in the form of a cupboard, which houses a 40-watt lamp behind the mirror. The light of the lamp is reflected from a curved white surface on to the face, ensuring an even diffusion of light—the essence of shaving in comfort.

Cellars, Cupboards, and Lofts

Think, too, of the convenience of a light in the cellar or in the loft—usually a neglected part of the house or the repository

* Manager of the E.L.M.A. Lighting Service Bureau.

of household requisites which are only used now and then. Why put up with the fire risk of using a naked candle, or the danger of ill-lighted stairs, when an electric lamp will make these quarters more useful at a cost of a shilling or so a year? It will result in the removal of obsolete gas pipes from the cellar, and the whitewashed wall will no longer be disfigured by damp patches—which while limiting the use of a cellar also menace the health of the household. Lights in cupboards and in the larder are such a welcome addition to the convenience of the housewife that to those who have tried them, they become a necessary part of the efficient management of the house. Many of these places could not be lighted with gas or oil on account of the heat generated and the vitiation of the air.

Electric light is a flexible and adaptable medium which finds employment in the home in many ways. These examples illustrate the use of pendants, brackets, standards, and other fittings in a number of situations. Abundant illumination, without glare or shadows, is the ideal for which all electricity users should strive

Lighting the Porch

Difficulty in finding a strange house on a dark night is the experience of most people. It is a comparatively simple matter to locate the doctor's house, because he takes the trouble to make it easily distinguishable from the rest by putting a red lamp over the gateway or in the porch. It is equally important for the ordinary householder to make it easy for visitors to find his house by illuminating the name or number. Contrary to general belief, the running cost of such exterior lighting is quite low, seldom exceeding a shilling or two a year, owing to the fact that a 25-watt lamp in each fitting is usually sufficient. Apart from convenience, this lighting imparts distinction to the dwelling.

What to Avoid

Good lighting is one of the least expensive of home comforts and one of our present-day problems is that of giving the public a correct perspective. The difference between good and bad lighting is quite small, or, expressed in a popular way, can be adequately met at the expense of a cigarette or so a day. The following points should be carefully checked over when a domestic lighting scheme is under consideration:—

1. Avoid gloom: insufficient illumination due to inadequate wattage or bad light distribution, is not only depressing, but is productive of headaches, eyestrain and general irritation.

2. Avoid glare: the dazzle from unshielded light sources is the most common cause of unsatisfactory home lighting. Prolonged exposure to severe glare is injurious to eyesight, and can only be eliminated by the exclusive use of pearl, opal, or sprayed lamps.

3. Avoid shadows: dark shadows resulting from insufficient diffused lighting are a source of endless annoyance not only to the housewife but to the whole family.

4. Avoid inconvenience: although electric lighting can afford the utmost convenience, advantage is rarely taken of its full potentialities. For example, the provision of sufficient plug points in every room is essential if the best is to be obtained from electric light, while two-way switching on stairs and in passages is another example of lighting convenience which should be standard practice rather than exceptional.

Home lighting to-day is much more than providing a single lamp dangling on the end of a piece of flex, and when used to the maximum, makes an important contribution to the art of home-making and exerts a profound influence on the well-being of the family.

A Faraday Illumination Design Course

MR. W. J. JONES, the author of the foregoing article, gave the opening lecture on October 12th of the "Faraday Illumination Design Course" which has been arranged by the London Lighting Service Bureau. His subject was "Faraday's Work and Its Results in Lighting Development"; he explained the significance of Faraday's discovery of electro-magnetic induction, and briefly reviewed the steps which led up to the immense electric lighting industry of to-day.

The course consists of seven lectures on consecutive Monday evenings. Next Monday the speaker will be Mr. L. E. Buckell, who will discourse upon the proper use of the electric lamp. Mr. A. G. Beaver, of the Sun Electrical Co., Ltd., will open the ensuing discussion. The third lecture will be delivered by Mr. S. Anderson, who will take as his subject "The Place of Electric Light in Industry." The lecture will point to the improvement in production and output which good lighting engenders.

On Monday, November 2nd, Mr. W. Millner, B.Sc., will lecture on "Selling Electric Light to the Shopkeeper"; and the November 9th lecture will be given by Mr. H. Lingard, and will be entitled "Floodlighting: Its Possibilities and Future."

Miss C. Haslett, C.B.E., will speak on "Lighting Opportunities in the Home" on November 16th, Mr. R. W. Kennedy being the opener of the ensuing discussion. The final lecture of the course, on "Architectural Lighting," will be delivered by Mr. R. W. Maitland, A.R.I.B.A.

Electricity Supply in Victoria. By H. R. Harper, M.I.E.E.

The progress of the national scheme during the past three years reviewed by the chief engineer of the State Electricity Commission

THREE years ago, the ELECTRICAL REVIEW published a highly authoritative survey of the initiation and development of Victoria's State scheme of electricity supply,* and, although it would be congenial to me as an engineer to indulge in a retrospect of the building-up of what is one of the most interesting and comprehensive electrical enterprises in the British Empire, I shall content myself with taking up the story from where it was left off, at the close of the financial year 1927-28. However, so much has happened since then that it will, after all, only be possible to give a brief and broad outline of events within the scope of this article.

Mr. H. R. Harper, M.I.E.E., Chief Engineer of the State Electricity Commission of Victoria

Financial Position and Prospects

The financial year 1927-28 really marks an epoch in the affairs of the State Electricity Commission, as during that period the scheme "turned the financial corner," inasmuch as incomings exceeded outgoings for the first time. This was a distinct achievement, considering that actually the scheme had been on a revenue-producing basis for little more than three years before profits began to be earned, and that the heavy initial constructional work in opening up the Yallourn brown-coal field, erecting thereon a 50,000-kW power station, and laying the foundations of a comprehensive transmission system for the State, had been succeeded by continuous capital expenditure, mainly in extending the transmission system and establishing a group of five small but very useful hydro stations in the north-eastern section of Victoria. The expansion since June 30th, 1928, may be gauged by the following figures:—

	Capital Expenditure	Annual Revenue	Profit
	£	£	£
1927/28	11,147,771	1,262,785	33,721
1928/29	12,220,583	1,427,751	45,571
1929/30	13,891,711	1,624,256	70,118
1930/31 (approx.)	15,000,000	2,500,000	—

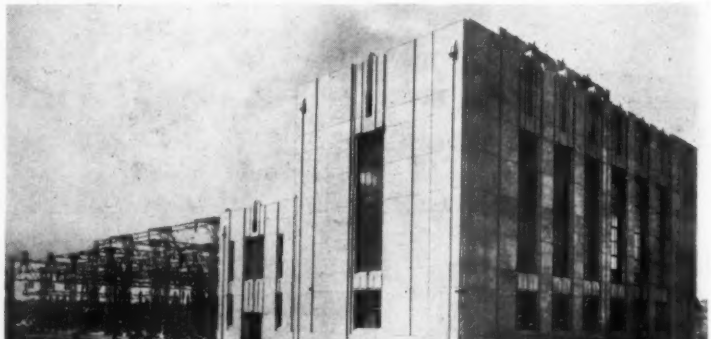
The returns for 1930-31 were not complete when this article was written. It should be noted that they are not on a comparable basis with those for previous years, as they include figures relating to the undertakings in the metropolitan area and Geelong, previously owned by the Melbourne Electric Supply Co., Ltd., but which passed to the ownership of the Commission on September 1st, 1930, under an agreement for acquisition, ratified by Parliament in December, 1924. It is now certain that the returns for 1930-31 will not show a profit. The scheme was weathering the world-wide depression satisfactorily until the intrusion of adverse overseas exchange rates, which added about £65,000 to the year's expenditure and converted what would have been a fair margin of profit into a loss. As considerable capital expenditure was incurred during the year in adding to the safety and reliability of supply, as well as in safeguarding and providing for public requirements for some years ahead, the reverse suffered in a year of general depression need cause no misgivings. That the reverse was so slight in the circumstances is really an indication of the stability of the scheme and of the State.

Erecting a Tower for the 132-kV line between Yallourn and Melbourne

There was an inevitable drop in the industrial use of energy, but this was almost counterbalanced by an increment in the domestic demand, a most encouraging feature, due to a growing appreciation of the value of electricity for all purposes in the home. This appreciation is being greatly stimulated by the Commission's two-part domestic tariff, as well as by an active policy of merchandising electrical appliances.

Merchandising Activities

The Commission's merchandising policy has been on an "intensive" basis for two years, and considerable benefits have accrued to both the Commission and its consumers. All kinds of domestic appliances are made available on hire-purchase terms, and on sound commercial lines. In the first year of intensive effort the turn-over in the districts then directly served by the Commission, which contained about 33,000 consumers, increased by 400 per cent. The returns for the year just ended show a still further increase over those for 1928-29, after excluding 144,119 metropolitan consumers taken over from the Melbourne Electric Supply Company, Ltd. Among the appliances sold during the year were over 1,100 electric ranges. The aim of the Commission is not only service at cost, but also to give expert advice to those concerned with the use of power. This advice has always been available to manufacturers, and recently the Commission added to its merchandising department a rural service section, the function of which is to promote the economical employment of electricity by those engaged in primary production. Another specialised section of the department deals with illumination, public, private and industrial.



The Richmond Terminal Station

In pursuance of its merchandising plan the Commission has established forty showrooms in various centres served by it. The most important, and certainly the most modern and extensive, showroom will be that for which provision is being made in the eleven-storey steel-framed concrete building now being erected for the Commission's metropolitan electricity supply district in Flinders Street, Melbourne, opposite the central railway station, perhaps the busiest single railway station in the world. At the same time that the Commission's merchandising operations are providing a permanent and appreciable increment in revenue, they are proving to thousands of consumers that the extended use of electricity in the home not only raises the standard of comfort very considerably, but conduces to economy. Mainly as the result of active propaganda and merchandising, the average consumption per domestic consumer in all of the Commission's districts has increased, in some instances by as much as 400 per cent. As, however, the highest average consumption in any district is not much more than 400 kWh per consumer per annum, there remains much scope for the

* ELECTRICAL REVIEW, October 19th, 1928, p. 651.

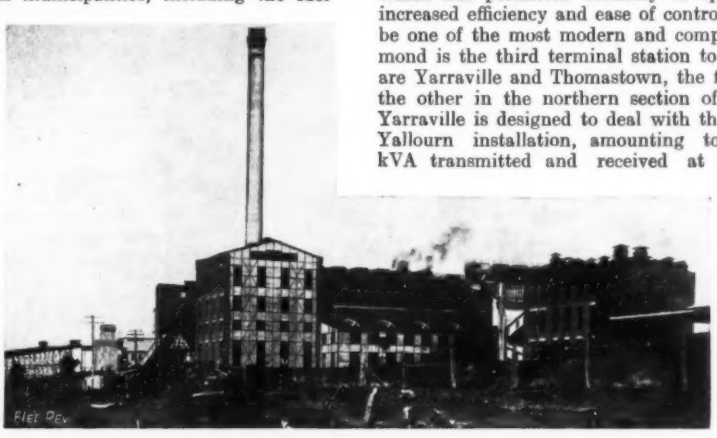
further exploitation of the domestic field. The success achieved in a year of general depression is a happy augury for the future, especially as there are encouraging signs of a return to normal, and with the progressive improvement of the load factor the oportunity will eventually arise for passing on the advantages of lower production costs to consumers, in which event the benefits accruing from the national scheme of supply, in providing an ample and dependable supply of electricity on an economical basis, and at cost, will be still further emphasised.

Of course, the future is not without its uncertainties but it is safe to assume that no State in the Commonwealth will be more responsive to the definite and appreciable efforts that are being made to rehabilitate the national finances and stimulate industry than Victoria, which is sound in its outlook, rich in natural resources, and possesses every facility for the intensive and economical employment of electrical energy.

Extensions of Supply

When the survey to which I referred at the outset of this article appeared in the ELECTRICAL REVIEW in 1928, the Commission was directly serving one hundred centres throughout the State with transmitted energy. The number has been increased to 160, while sixteen metropolitan suburbs have been taken over from the Melbourne Electric Supply Co., Ltd., so that, with the metropolitan districts previously served by the Commission, the State scheme now controls the retail distribution of electricity in 178 centres, 108 of which had no supply previously. In addition, it supplies electricity in bulk to ten metropolitan municipalities, including the Melbourne City Council. All of these municipal undertakings operate under franchises which will not expire for many years.

The year which closed on June 30th last witnessed no new extensions of supply, owing to the curtailment of loan funds, which have to be provided by Parliament. Consequently, the construction of the ring main which is to link Ballarat, Bendigo, and Geelong with the supply system, and which will consummate the scheme as a complete power system for the State, had to be postponed, after reaching Castlemaine. Each of the three provincial cities mentioned has its own efficient generating plant, which will be sufficient for its requirements until the ring main reaches it. The most disappointing effect of the postponement is to delay supply to numerous centres within and without the ring. En route to Castlemaine, the main linked up thirteen centres, no less than eight of which had no supply previously. It is this aspect of extensions of supply which explains the Commission's policy of acquiring undertakings in the larger rural centres of demand, because extensions of transmitted supply to them bring smaller centres within economical range of service. It is also essential, in organisation and economical management of districts, that local undertakings be eliminated.



The Briquetting Factory at Yallourn

Extending and Safeguarding the Main Supply

Careful computations indicated that a yearly increment of nearly 10,000 kW of generating plant would be required to meet the growing requirements of centres already supplied, and to provide for extensions to new centres. In 1928, therefore, Parliament approved of a major extension of the supply system, designed to satisfy demands upon the system up to and including the winter of 1934. The scheme provided for an extension of the Yallourn power station to accommodate three turbo-alternators (each of 25 000 kW), with the equivalent boiler plant housed in a second boiler-house, and the building of a second 132,000-V transmission line and new terminal station at Richmond, in the eastern section of the metropolitan area. It was intended that the first of the three new units of generating plant should be ready for the winter of 1931, but the unforeseen curtailment of industrial development and demand for power has removed the urgency, so that the programme has proceeded more leisurely than would otherwise have been the case, and the first stage will be only partially completed in respect of boilers and auxiliary equipment during 1931. The new plant has been schemed and laid out as a second unit of the original station. Each unit will have a normal capacity of from 50,000 to 60,000 kW, and each will be capable of operating independently, or with a degree of interchange.

While the programme respecting the power station extension is not being exactly conformed to, it was necessary to push ahead with the new transmission and receiving facilities, not only to have them in readiness for the extended power station, but because of the desirability of providing assistance for the existing facilities, which had been working to full capacity for several years, with nothing in reserve. Both the second tower line and the terminal station were completed and brought into operation early this year, thus increasing the flexibility of the main supply system, and guarding against anything in the nature of a protracted interruption of supply. That the system has been so free from such interruptions in the past is, in the circumstances, an excellent performance, indicative of sound construction and maintenance.

The Terminal Stations

The new tower line follows the route of the original line until nearing Melbourne. It was erected whilst the old line was in full operation, a somewhat hazardous undertaking that was completed well on time and without incident. For the erection of high-voltage transmission lines, which now penetrate all districts in Victoria, considerable clearing has usually been necessary. The new terminal station at Richmond is designed for a final capacity of 90,000 kVA, which will be accomplished in three 30,000-kVA stages, the first of which is now in operation. This station embodies all the most advanced ideas, with a somewhat unconventional lay-out, which has permitted economy of space and material, with increased efficiency and ease of control. It may be claimed to be one of the most modern and compact in the world. Richmond is the third terminal station to be erected. The others are Yarraville and Thomastown, the first in the southern and the other in the northern section of the metropolitan area. Yarraville is designed to deal with the production of the first Yallourn installation, amounting to approximately 60,000 kVA transmitted and received at the terminal point at 120,000 V. Thomastown is designed to receive and regulate the energy from the Sugarloaf - Rubicon group of hydro-stations in the north-east and to transform it from 66,000 V to 22,000 V for metropolitan distribution.

In its inter-connected system of supply, the Commission has now an aggregate of 150,000 kW of generating plant installed, including that at the hydro-group and at two peak-load stations in the metropolitan area. When the extension at Yallourn is complete the aggregate will be increased to 225,000 kW, with the requisite transmission and receiving facilities. It will thus be seen that the system is on a sound basis, and gives a guarantee of adequacy and dependency that augurs well for the future electrical development of the State.

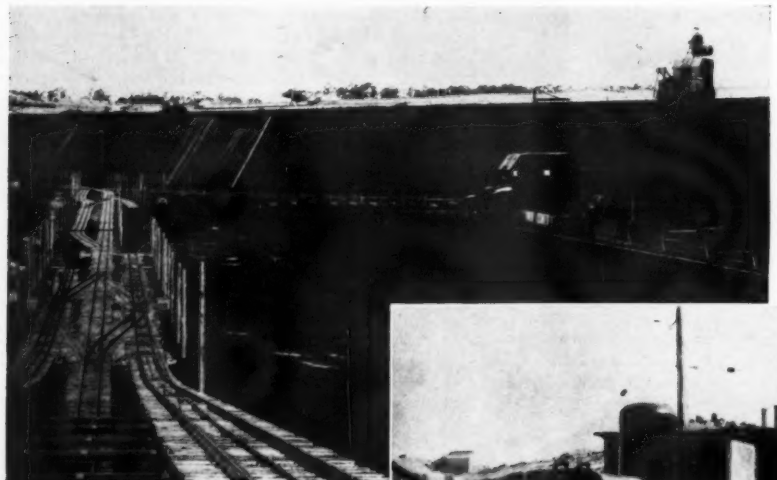
Yallourn Brown-coal Deposits

The last three years have seen solid progress in developing the Yallourn open-cut brown-coal field, and in adding to the capacity and flexibility of the main supply system. The Yallourn open-cut, as at present developed, represents 128 acres of uncovered coal, of the thickness of 180 ft. It is at once an illustration of the immensity, value and accessibility of the deposit, and of the mechanical perfection which has been attained in the winning of open-cut brown coal. The illustration of the Yallourn open-cut (p. 570) clearly shows the small quantity of overburden, compared with the depth and unbroken regularity of the coal seam. In the background, and to the right, is seen the overburden dredge working above rail level and stripping the overlying 28 ft. of soil which covers the coal. The deep coal dredge in the foreground is that recently installed on the 90 ft. level formed by the dredge in the background; it will dig to the bottom of the 180 ft. seam and work in conjunction with an electric steep haulage. Reference has already appeared in the ELECTRICAL REVIEW to the modifications made in the original methods of coal-winning employed at Yallourn. These modifications involved, principally, the substitution of land dredges for power shovels and of electric for steam traction, including rope haulages. The modifications have been in operation long enough to enable final judgments to be formed, and it will suffice to state that they are fulfilling all expectations with regard to both economy and efficiency. G

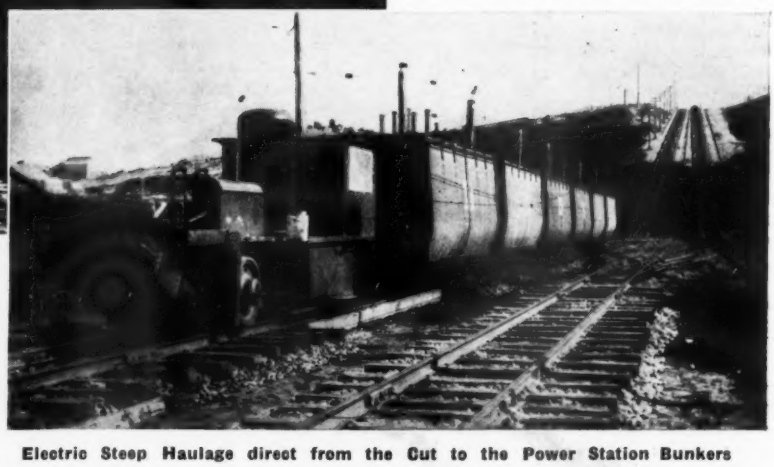
The overburden dredge, which can work both above and below rail level, is shifting each year about one million cubic yards of the 30 ft. of clayey soil which mostly covers the coal. The dredge is operated by direct current at 1,000 V, and strips away the overburden with its revolving ladder of twenty-six 15 cu. ft. buckets, each of which automatically empties itself into a hopper in the dredge as it proceeds on its way for another "bite." From the hopper the material is fed to a procession of electric trains plying between the dredge and a permanent dump half-a-mile away from the cut. The overburden trains consist of rakes of eleven 20 cu. yd. trucks, hauled by 440-h.p. locomotives. At the dump hopper, the trucks are mechanically emptied by means of compressed air from the engines, and if it were necessary to have a hopper long enough to accommodate a full train, the eleven trucks could be discharged in two minutes by this method. From the hopper, belt conveyors take the overburden to the extremity of a boomstacker, which can swing in the arc of a circle with a radius of 115 ft. 9 in., and pile the overburden into heaps 60 ft. high, 435 ft. long, and 255 ft. across.

The Coal-winning Plant

There are two deep dredges on the coal itself. One is on the surface of the coal, digging to a depth of 90 ft., with its revolving ladder of thirty-one buckets, each of 28 cu. ft. capacity. The second dredge, which was installed recently, is placed on the 90-ft. level, and between them the two machines, which have a combined normal capacity of 1,000 tons an hour, will dig all coal from the top to the bottom of the 180-ft. seam. As the uncovered coal amounts to 8,000,000 tons, and as the plan is to dig this coal right out, the overburden dredge will have no difficulty in baring further large reserves in the meantime.



The Yallourn Open Cut in June, 1931



Electric Steep Haulage direct from the Cut to the Power Station Bunkers

Both the coal dredges operate similarly to the overburden dredge, excepting that they can be used to dig below rail level only. That on the surface will continue to load into electric trains, consisting of rakes of six 20-ton trucks, which are emptied at the 1,500-ton power house bunker by means of compressed air from the locomotives. The dredge on the lower level, however, works in conjunction with an electric steep haulage, or huge winch, which is the most modern and economical development in open-cut brown-coal transportation. It lowers and raises the coal trains on a grade of 1 in 7 from the main coal bench, 130 ft. below ground level, to the level of the 1,500-ton bunker at the power house, a difference of 160 ft. Going up-grade, a strong dummy truck, attached to the steel haulage cable, and fitted with powerfully sprung buffers, places itself behind the loaded train, pushing it up, while an empty train descends on an adjoining set of rails, so that the dead weight of the ascending train is partly balanced by that of the descending train, ensuring that the useful load only has to be hauled up. The trains to be hauled up consist of six trucks, with an aggregate capacity of 120 tons. It takes only three and a half minutes to lift a full coal train from cut to bunker. The present capacity of the Yallourn steep haulage is 11,000 tons in fifteen hours, but, if necessary, this capacity can be increased to 20,000 tons by a rearrangement of the track lay-out. The haulage engine, which is in duplicate, consists of two rope drums, each of 20 ft. diameter. It is operated by two 520-h.p. motors, and in case of necessity is capable of raising or lowering one train unbalanced.

The present requirements of the Yallourn power station and briquetting factory approximate 10,000 tons of coal daily. The briquetting factory has just been extended to provide for a production of 1,200 tons of brown-coal briquettes a day, which is treble that of the original factory. Despite the keen competition of other fuels, a market for the full output of the factory has been developed, the recognition of the value of briquettes as industrial fuel being evidenced by the fact that 300 manufacturers in the State receive regular supplies. Briquettes are also a popular household fuel. The principle of service which runs through the Commission's policy in its dealings with the public is further evidenced by the functions of the Fuel Sales Branch, the staff of which includes experts whose services are at the disposal of those concerned with boiler problems. This principle is still further evidenced by the very complete system of distribution of briquettes that is afforded by the series of depôts right throughout the metropolitan area. These depôts ensure regular supplies, thus saving industrialists the expense of carrying large reserves.

Duplication of Station

The original installation of five 12,500-kW units at the Yallourn power station was completed to six units in 1928, and the station is at present being duplicated, so that in 1935 or thereabouts, its normal capacity will be 100,000 kW, which, with the requirements of the briquetting factory, will necessitate about 13,000 tons of coal a day. The coal is fed to the power house boilers as it comes from the open cut, and record combustion results have been achieved in the burning of this moisture-laden fuel. This efficiency is the result mainly of the researches of the Commission's own staff, consequent upon the original boilers at Yallourn having to burn coal containing about 15 per cent. more moisture than they were designed to do, based on the coal mined at Yallourn up to that time. The present position and trend of the future in regard to brown-coal burning, and the principles which have influenced its development at Yallourn, might well occupy the whole of this article, but they are sufficiently well known to engineers abroad, having formed the subject of a paper read at a recent World Power Conference. The experience gained has been invaluable in shaping the methods being adopted in the extension of plant at Yallourn, and it is fully expected that the extension boilers will register an even better performance in the combustion of raw brown coal than those which have already been recorded by the Commission.

It will be recalled that the first and specific duty of the Electricity Commissioners, under the Act of 1918, was to submit a scheme for a coal-winning and electricity supply undertaking. They were also required to:—

(1) Co-ordinate and unify all electricity supply undertakings, and adopt a standard system frequency;
(2) encourage the use of electricity, particularly for industrial purposes; and
(3) ascertain the extent of the generating resources of Victoria, both in fuel and in water.

The foregoing account of recent developments indicates that the Commissioners have taken a broad and comprehensive view of their duties.

The Canadian Domestic Market.

By A. S. L. Barnes, A.M.I.E.E., Toronto

The author of this article has been the "Electrical Review" Special Correspondent in Canada for many years. Mr. Barnes is General Laboratory Engineer to the Ontario Hydro-electric Power Commission, and has consistently urged British manufacturers to deal boldly with the market

CAREFUL study convinces one to-day, as it has so often done before, that, for the British manufacturer, the Canadian market is not an easy one to enter.

This is so for various reasons which are discussed later in this article. But the situation must be faced in the spirit that recognises that difficulties are made to be overcome.

Domestic electrical appliances in common use in Canada, in the approximate order of their popularity, are :—

1. Smoothing-irons.
2. Toasters.
3. Air-heaters.
4. Washing-machines.
5. Ranges (Cookers).
6. Grills.
7. Hot-plates.
8. Water-heaters.
9. Refrigerators.
10. Grates.
11. Ironing-machines.

In addition there are coffee-percolators, radio-receiving devices operated from the supply lines, motor-driven blowers for domestic furnaces, and, to a smaller extent, dish-washing machines, hair-dryers, bed-warmers, floor-polishers, electrically driven sewing machines, mains clocks, &c.

The report of the "Mission" which the Federation of British Industries sent over here early this year is worthy of close study, for, while it reiterates many things that have been said before, both in the pages of the ELECTRICAL REVIEW and elsewhere, it clearly describes conditions peculiar to Canada and makes some suggestions specially relevant to our present subject.

For example, reference is made to "The desire of the Dominion to purchase goods from Great Britain and other Dominions in preference to purchasing from foreign countries."

The writer knows of a recent instance where this desire definitely sent an order for electrical equipment to Great Britain instead of to the United States. It is true that prices were about equal and that England promised better delivery, but similar equipment had previously come from the U.S.A. and its merits were well known.

"The imports to Canada from Great Britain in the year 1929-30 amounted to $190,000,000 and from the U.S.A. $847,000,000."

Reference to the table on the next page, headed "Canadian Imports and Exports of 'Electrical Aparatus'," reveals an even worse condition in respect of the merchandise which falls into this class.

It is pointed out in the report that lakes, rivers, canals, and through-rail traffic all form connecting links from one country to the other. The report might well have included highways and even the air!

"U.S.A. films, newspapers, periodicals, broadcasting, joint conventions, &c.," are mentioned as important factors.

"The ever-increasing investment of U.S.A. capital in Canadian industries stimulates the flow of U.S.A. goods to Canada."

Commenting on the best way of doing business with Canada and recommending co-operation with existing Canadian interests the report states ". . . if competition becomes too keen between the Canadian producer and the importer a move is made to obtain higher tariff protection for the Canadian producer. Higher tariffs naturally drive outside producers to open up factories in Canada and by so doing to increase competition. The Canadian manufacturer realises this and has expressed willingness to devise ways and means of co-operation."

The writer has no knowledge as to the truth of the final sentence of this last quotation as regards the electrical industry, but there is no doubt whatever of that of the previous sentence in relation to practically all industries; almost every week since Canadian tariffs were raised recently the newspapers have recorded the establishment of a branch factory of some United States' industry, and in not a few instances these have been electrical.

The Hydro-electric Power Commission of Ontario has, for several years, published annually in its monthly *Bulletin* some very interesting figures relating to the use of domestic electrical appliances in Ontario.

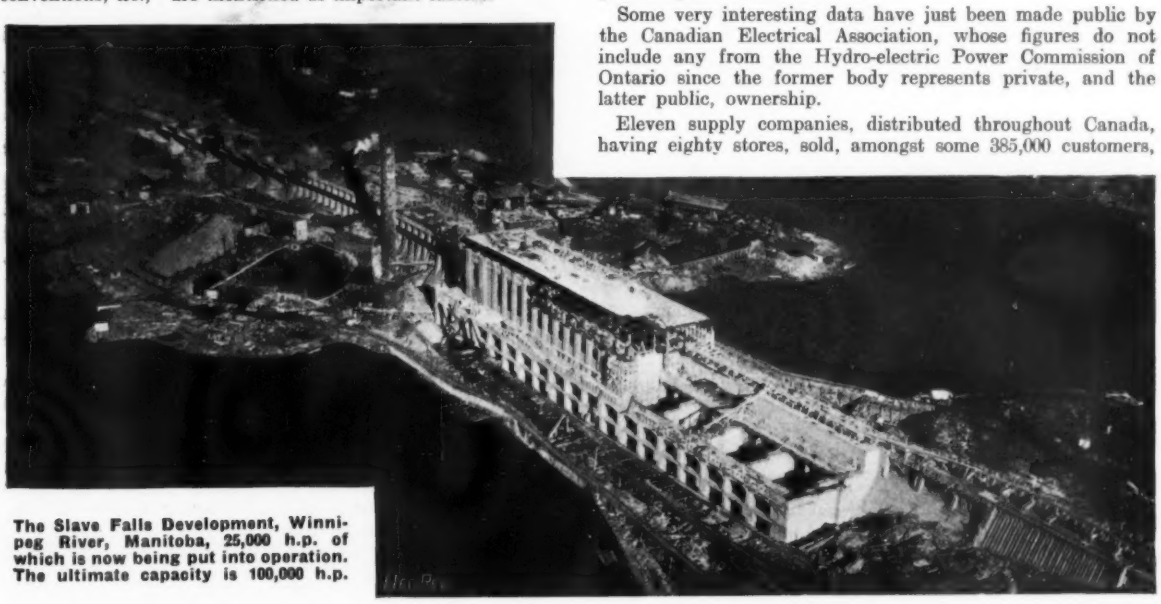
In October, 1930, the following figures, amongst others, appeared :—

Electrical Appliances.	No. of Appliances Estimated in use among 431,270 Consumers, Dec. 31, 1930.	Saturation (Per cent.)
Ranges	105,312	24.4
Hot-plates	45,188	10.4
Washing-machines	120,393	27.9
Vacuum-cleaners	95,138	22.1
Water-heaters	38,136	8.8
Grates	19,878	4.6
Air-heaters	155,734	36.4
Ironing-machines	3,968	0.9
Smoothing-irons	381,490	89.9
Refrigerators	25,000	5.9
Toasters	215,498	50.4
Grills	49,879	11.6

Study of the foregoing figures in conjunction with similar ones for previous years shows that the *annual rate of increase* in the percentage of saturation does not exceed 2.65 for any appliance and for some of them it is less than 1.0. This indicates that it would take very intensive selling campaigns extending over a considerable period to bring the percentage of saturation up to a really high figure; such, for example, as that shown for electric smoothing-irons. This would be the case even if there were no increase in population; the increase, though not very rapid, continually tends to keep the percentage of saturation down.

Some very interesting data have just been made public by the Canadian Electrical Association, whose figures do not include any from the Hydro-electric Power Commission of Ontario since the former body represents private, and the latter public, ownership.

Eleven supply companies, distributed throughout Canada, having eighty stores, sold, amongst some 385,000 customers,



The Slave Falls Development, Winnipeg River, Manitoba, 25,000 h.p. of which is now being put into operation. The ultimate capacity is 100,000 h.p.

from May, 1930, to April, 1931, more than $2,375,000 worth of domestic electrical appliances. The highest average value of sales per customer at any one store was $43.90 and the lowest $0.72, the average for all stores being $6.17. One store, in Winnipeg, sold almost a quarter of a million dollars' worth of appliances.

The Government records of manufacturing industries, and of imports and exports, do not give full details regarding domestic electrical appliances, but those that are available

Hydro-electric Building, Niagara Falls

have been examined, and the information given in the following tables have been gleaned from them :—

PRODUCTS OF THE ELECTRICAL APPARATUS AND SUPPLIES INDUSTRY IN CANADA

Electrical Appliances.	1928. No.	1928. Selling Value at Works. $	1929. No.	1929. Selling Value at Works. $
Flat-irons	219,082	419,294	196,184	426,120
Hot-plates and Grills	47,264	284,492	56,841	218,308
Percolators	—	41,278	3,288	47,376
Stoves and Ranges*	4,396	406,807	9,433	850,974
Toasters	94,980	273,756	83,537	221,767
Water- and Air-Heaters	45,960	371,128	53,246	435,557
Floor-Polishers	480	14,328	1,654	16,959
Refrigerators	2,818	740,264	4,254	1,548,251
Vacuum-Cleaners	68,330	2,428,230	80,451	2,915,336
Unspecified	—	144,228	—	172,455
Total	—	5,123,795	—	6,853,103

* In addition to these there were 30,754 electric stoves and ranges, valued at $2,157,524 made in 1929, but listed separately in Government records.

The manufacture of one appliance has made great progress during the past seven or eight years as may be seen from the following table :—

PRODUCTION OF ELECTRIC VACUUM-CLEANERS IN CANADA

Year.	Number.	Value—$.
1923	28,206	1,020,898
1924	36,529	1,290,147
1925	43,996	1,587,758
1926	43,454	1,345,427
1927	57,901	1,914,911
1928	68,330	2,428,230
1929	80,451	2,915,336
1930	108,927	3,862,998

The following figures, also relating to vacuum-cleaners, given for 1930, are interesting because of the fact that importations, even from the United States, are small compared with the Canadian production shown in the preceding table.

Imports into Canada.	No.	Value—$.
Total Imports	12,159	673,302
From U.K.	7	341
From U.S.A.	12,143	672,698

The table below shows that a large proportion of the Canadian production of vacuum-cleaners is exported :—

EXPORTS FROM CANADA

	No.	Value—$.
Total Exports	56,092	2,232,011
To U.K.	42,971	1,742,546
To U.S.A.	19	7,266
Other countries	13,102	482,199

The figures given below show, approximately, the condition of affairs in respect of " Electrical Apparatus " for the years stated—they do not include vacuum-cleaners :—

CANADIAN IMPORTS AND EXPORTS OF "ELECTRICAL APPARATUS"

Year.	Country.	Imports. $	Per cent. of Total.	Exports. $	Per cent. of Total.
1929	U.K.	2,215,000	6.0	286,000	10.4
	U.S.A.	33,944,000	92.1	109,000	4.1
	All Countries	36,840,000	100.0	2,643,000	100.0
1930	U.K.	3,195,000	10.5	272,000	11.8
	U.S.A.	26,421,000	87.2	97,000	4.2
	All Countries	30,281,000	100.0	2,290,000	100.0

Unfortunately, the Government records of imports and exports are not nearly so detailed as those of " production " and direct comparison is impossible.

It seems to be fairly evident from the data presented above that the Canadian market for domestic electrical appliances, although admittedly limited, is worthy of attention. Relative to the total population the number of domestic consumers is large, and owing to the fact that in many parts of this country electricity is very cheap, the annual consumption per consumer is large compared with that in most other countries. In this connection the following table is of interest :

Province.	Average No. of Dom. Consumers per 100 of Population.	Annual Net Revenue per Dom. Consumer. $	Average Consumption per Dom. Consumer. kWh
Prince Edward Island	4.04	28.84	—
Nova Scotia	7.27	26.94	—
New Brunswick	7.19	25.84	—
Quebec	13.86	23.23	630
Ontario	16.58	25.56	1,500
Manitoba	11.18	35.94	3,000
Saskatchewan	5.10	38.50	—
Alberta	8.50	27.75	—
British Columbia and Yukon	21.90	24.98	930
Canada	13.19	26.02	—

The writer, while he can lay no claim to being an authority on trade matters, has been in Canada long enough to have gained a good knowledge of conditions here. One thing that appears to be certain is that if ever the British manufacturer of electrical appliances is to do any business here, either entirely by means of exports from Britain or by complete or partial manufacture in Canada, now is the time to make the attempt; moreover, it should be done in a determined manner and by co-operative action.

Firms at home must, in many instances, whether they like it or not, be prepared to construct their devices to suit the Canadian market and in some cases to comply with specifications which follow, all too closely, U.S.A. standards. Thus it is difficult to see how an expensive English heat-insulated water-tank, equipped with an immersion heater, could be readily sold in Canada, where very many houses already have water-tanks which only need to be lagged with about two inches of hair-felt or its equivalent and to have an immersion heater screwed into a hole which already exists in the tank. In one thriving city here, heaters which simply clamp on around the outside of the tank are being tried, and the writer was informed not long ago that a 750-watt heater of the " clamp-on " type could be installed complete with wiring, and the tank heat-insulated, for something like $45.

Very efficient heat-insulation of the tanks is claimed for those of British manufacture, but in this land of cheap electricity it hardly pays to purchase very high efficiency—it is cheaper to waste a little current over a period of years. This illustration is given to indicate how necessary it is for British manufacturers to study the conditions here.

To sum up : Definite, concentrated action, as soon as possible —not in three or five years' time—by a strong group of firms

Interior of Niagara Falls Hydro-electric Building

resolved to keep British products prominently before the Canadian public is what I conceive to be the only way of dealing satisfactorily with the situation in this country. Strong and persistent effort should also be made gradually (it can only be done very slowly if it is to be done at all) to weaken the dominating influence of United States standards and practice. This influence will always exist and will always be powerful, but whereas it is now about 100 per cent. effective and British influence is nil, I believe that if the right steps be taken a worth-while change can be effected; and there is little doubt that many people in Canada will welcome the change.

Domestic Development in South Africa. By E. Poole, A.M.I.E.E.

The Assistant Electrical Engineer of Durban attributes the rapid progress in the Union to low secondary rates, hire-purchase schemes and persistent publicity

MUNICIPAL electrical engineers and contractors in South Africa generally are fully alive to the possibilities of the application of electricity to every phase of life, and progress now depends mainly on the education of the public regarding these possibilities, and on the price of apparatus being kept within the means of likely purchasers. The more broad-minded Councils have realised that price is of great importance, and that the lower the price the greater the demand.

In regard to educating the public, very useful work is now being done by the S.A. Electric Lamp Association (S.A.E.L.A.), which was established with its centre in Johannesburg some eighteen months ago, and whose representative has already visited most of the towns in the country where lectures have been given dealing more particularly with efficient lighting. Still more useful is the outcome to be expected from the recently formed S.A. Electrical Development Association, which has been sponsored by Dr. Van der Bijl, chairman of the Electricity Supply Commission of South Africa, and is being well supported by the various municipalities.

Propaganda by Municipalities

Apart from the publicity campaigns of these two bodies, several of the municipalities themselves are well to the fore, Durban having some years ago pioneered the domestic application of electricity which gives it such a lead to-day. The enterprise of the Capetown Electricity Department in its

The Strand Street, Cape Town, Showrooms

present intensive campaign for encouraging the use of electricity is reflected not only in the reduction of tariffs and a hire-purchase scheme, but also in its showrooms, of which there are four at various points in a large distribution area. In the central showroom in the city, cookery demonstrations are given twice a week on different makes of stoves by qualified demonstrators. Apart from their great advertising value, these showrooms serve a very useful purpose in maintaining a public interest in the use of electrical appliances, and their influence in making the use of electricity for domestic purposes increasingly popular cannot be over-estimated. Durban's example of a monthly Electrical Bulletin, dealing with electrical and other subjects of interest to the consumer, which is enclosed with each account for electricity, has been followed by a similar production in Pretoria, while exhibitions, competitions, etc., all add to the curriculum associated with the electrical age educational campaign.

Reorganising for Expansion

Of late a number of municipalities have been remodelling both the generating and distribution sides of their electrical undertakings in preparation for the demand which they know they must meet, and it is pleasing to note how even the small towns have followed the examples set by the larger. The most important development to record is the change-over from d.c. to a.c. If a domestic load is to be secured, it is practically an impossibility to retain a d.c. supply, and no fewer than twenty-four towns have changed over in the past few years. Owing to the spreading out of the tentacles of the Electricity Supply Commission from the few centres where it has established power stations, a number of small plants have been closed down in favour of purchase in bulk with a consequent reduction in tariffs and greatly increased ability to encourage and realise greater demands.

Some idea of the progress of extensions in South Africa is reflected in the Electricity Supply Commission's annual report now published, which states that during 1930 the electricity extension schemes of urban local authorities reported on by the Commission involved a total capital expenditure of over £750,000. From this it is abundantly evident that the advantages of electricity in both domestic and industrial spheres is spreading and that the market for electricity supply in South Africa is now being seriously opened up.

Mr. E. Poole, as Assistant Electrical Engineer of Durban, where domestic development has proceeded very rapidly, is well qualified to write upon this aspect of modern South Africa

Throughout the Union of South Africa there is a total of 141 municipal electrical undertakings; ten of these are in towns with populations varying between 202,000 and 18,500, the balance of 131 having populations from below 18,500 to less than 1,000. No fewer than fifty-two small undertakings have been established during the past five years.

The Influence of Sound Tariffs

There is little doubt that the three main essentials to domestic development are: first, a low tariff; then assisted purchase of appliances; and finally adequate publicity. By a low tariff is meant a two-part tariff with a secondary rate of not more than one penny, the primary rate being based on the "Norwich" or any similar system.

What little competition obtains is from wood, coal, or oil with the exceptions of Johannesburg, Capetown, Port Elizabeth, and Grahamstown, where gasworks exist. It is very difficult to follow the reasoning which led Johannesburg recently to extend an existing municipal gas plant when it already had a large electrical undertaking in operation; the result has been that, for its output, the electrical load does not make a good showing. To-day, we find about twenty-four towns with a secondary rate from one penny downwards, and it is pleasing to note the advances made since a similar article was written for the Special Domestic Issue of the ELECTRICAL REVIEW four years ago.

The Showroom Building at Wynberg

Durban's example is one of which many towns in other parts of the world might well be proud, as it was the pioneer town to introduce a low secondary rate; Port Elizabeth is now about to follow suit, and Capetown has within the last few months fallen into line. The reason that Cape Town does not at present make as good a showing on the domestic side as some of the other large towns is no doubt due to its not having seriously pushed this business, preferring, as is good policy, first to put its house in order on the distribution side, a work which has now been practically completed (see Electrical Review, July 17th, 1931).

Five Years of Progress

The accompanying curve from 1926 to date shows the rapid rise in the consumption of electricity for domestic purposes, particularly since the lower tariffs and hire-purchase scheme were introduced (September, 1930). A very bright future in the development of its domestic load can be looked forward to, as out of its 31,610 consumers, 18,000 are on a lighting rate only, of whom it may be assumed 17,000 are using gas or some other means for cooking purposes.

A return by the Government Statistical and Census Office of the consumption of electricity as at September of last year for private dwellings in the principal towns of the Union has just been issued. Since then, some of the towns have modified their tariffs, but it is felt that the table given below, extracted from this return, will be of interest.

The figures relating to King Williamstown show how even a small town may develop.

Consumption Per Household

These returns apply to 88,120 householders in the eleven principal towns enumerated, who between them consumed 8,063,444 kWh in September, 1930, *i.e.*, 91 kWh per household. If advantage had been taken of discounts they would have paid £64,425, or 14s. 7d. each, or 1.92d. per kWh consumed.

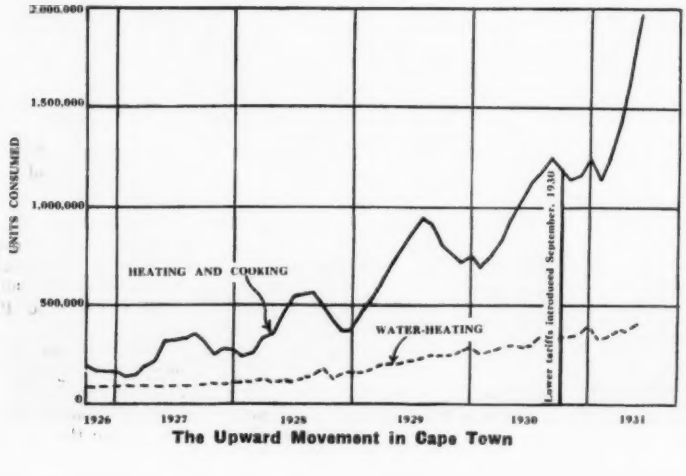
The range in consumption is, however, very varied; 58.84 per cent. of these households consumed less than 50 kWh per month each, while 11.71 per cent. consumed over 200 kWh, with an average of 424.94 each. The former contributed approximately 36.56 per cent., and the latter 27.94 per cent. of the total revenue. Those consuming under 50 kWh paid an average rate of 4.21d., and those consuming over 200 kWh an average of .985d. The cost per month for the former was on the average 9s., and for the latter 34s. 11d. As far as the tariffs under review are concerned, Durban shows by far the highest consumption per household, namely, 235.2 kWh. Taking individual tariffs, Durban (borough tariff), 262 kWh, and Pretoria (sliding secondary tariff), 256 kWh per consumer, were the highest and it is interesting to note that in these two cases the average charge per kWh was the lowest, namely, .896d. and 1.285d. respectively, while at the same time the total amount received per consumer was the highest, 19s. 5d. and 27s. 5d. respectively.

Overhead Distribution in Pretoria

Town.	No. of Domestic Consumers.	KWh. sold per consumer.	Average revenue per consumer.	Average charge per kWh. (pence).	% of Consumers using 200 kWh. and over per month.	Tariff.
			s. d.			
Durban	13,723	235.2	19 5	0.989	43.3	On valuation—5d. and ¼d. less 10% if paid in seven days. *Out of Borough.*—6¼d. and ¾d. less 10% if paid in 7 days. Minimum, 12s. 6d.
Pietermaritzburg ..	1,858	107.9	15 4	1.708	17.3	6d. on room basis and 1d. less 10%. Minimum 2s. 6d. *Out of Borough:* 9d. room basis and 1¼d. less 10%. Minimum 10s.
Pretoria	8,206	97.5	15 4	1.889	13.5	5d. on valuation and 2d., 1d. and ¾d. Minimum 10s. Alternative 5d. on valuation and 2d. minimum 5s.
Bloemfontein	2,834	101.1	15 6	1,840	10.9	Minimum from 4s. to 18s. on valuation and ¾d.
Cape Town	22,303	61.5	13 9	2,090	5.9	Flat 5¼d., less 10%. Minimum, 5s. **Alternative:* 5¼d. room basis and 1.1d. less 10%. Minimum, 10s.
Port Elizabeth ..	6,033	61.4	10 5	2.034	5.0	*6d. on valuation and 1d. less 5%. Minimum charge 4s. 3d. Meter rent, 9d.
East London	2,340	51.1	12 2	2.852	3.5	8d. on valuation and 1d. Minimum: 7s. 4d.
Johannesburg	26,325	56.7	13 6	2.862	3.2	6d. on room basis and ¾d.
Krugersdorp	564	56.0	14 1	3.026	2.1	18 at 6d. next 42 at 1¼d., excess 1d. Minimum, 9s. Meter rent, 1s.
Kimberley	2,826	40.7	16 9	4.948	1.3	*6d. light, 2¼d. heating. Meter rent, 1s. to 2s. 6d.
Benoni	1,108	43.9	12 7	3.450	1.2	5d. room basis and 1¼d. Minimum, 5s.
Kingwilliamstown ..	803	118.2	19 6	1.983	—	9d. and ¾d. room basis.

Monthly Return of Domestic Consumers Only. September, 1930

(In order of consumers using 200 units and over per month).



The Upward Movement in Cape Town

The latest figures from Capetown show that the average price per kWh received for the month of May was 1.41d.; it is anticipated that by next year the average price per kWh received will be less than 1d. An asterisk indicates that the tariffs have been reduced since the publication of the returns.

The tabulation which also shows the percentage of consumers using 200 kWh and over per month is of particular interest, as they may be looked on as more or less fully equipped with cooking or heating appliances.

Overhead Distribution

Distribution work is mostly carried out by means of overhead lines, and the illustration above shows an example in a Pretoria residential suburb. The transformer is mounted on two poles fed by an underground h.v. cable controlled from a near-by kiosk, and the l.v. mains are carried overhead, house services being taken off the nearest pole on to the consumer's roof.

The practice in Durban is to mount the transformer on a single pole which carries a high-voltage, three-wire, single-phase circuit. The two outer wires form the earthed neutral, and they are bridged across on either side of the pole arm to provide a guard should the live wire break.

The transformer is protected by a primary draw-out fuse operated by a link stick. Below the transformer is a fuse box controlling the various l.v. distributors.

Overhead Lines. By G. W. Molle, B.Sc.(Eng.), A.M.I.E.E.

The Hon. Secretary of the O.L.A. says that recent developments tend towards higher voltages, longer spans with few supports, and simplified design

THE Electricity Commissioners' reports show that since 1920-21, 35 transmission lines at 6.6 kV, 130 transmission lines at 11 kV, 23 transmission lines at 20-22 kV, 162 transmission lines at 33 kV, and 18 transmission lines at 66 kV, have been sanctioned, showing the tendency to concentrate on 33 and 11 kV.

Applications for sanction to erect overhead lines, other than main transmission lines, have increased from nil in 1920 to 890 in 1929-30; consents from 46 in 1921-22 to 901 in 1929-30; wayleave applications, in the same period, from one to 296, annually; local inquiries from nil to 138; and wayleave consents from nil to 145. The high standard of construction is emphasised by the small number of refusals to grant overhead line applications.

Notable events during the same ten-year period include:—

1923-24: first revision of Overhead-line Regulations for twenty years.

1927-28: conference on rural supply.

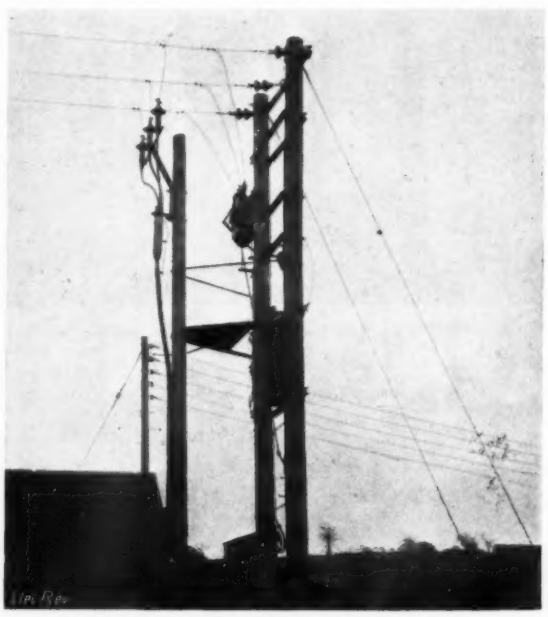
1928-29: £1¼ millions development schemes submitted by various undertakings. Rural parishes supplied, 1,435; not supplied, 3,047. The Bedford scheme announced. New code of Overhead-line Regulations published. Completion of a draft Standard Wayleave Form by the Commissioners and the Law Society (this matter is believed to be still under discussion).

1929-30: £12,250,000 spent on the grid. Bedford scheme in hand. Norwich scheme adopted. £½ millions to be spent on development by various undertakings. Schemes approved for supplies to 500 localities.

1931: Bedford scheme completed. Norwich scheme in hand. Amended Overhead-line Regulations issued.

Rural Areas

Rural areas comprise 92 per cent. of the country's total area and contain 22 per cent. of the population. They are supplied by approximately 5,000 miles of distribution network, wherein high-voltage overhead lines average £1,000 per mile, compared with £1,663 for underground; and l.p. overhead lines average £564 per mile, compared with £1,177 per mile underground:



South Wales E.P.D. Co.

Terminal Pole Sub-station at Rhiwderyn

showing that the great saving in using overhead lines occurs in l.p. distribution. Too often, however, one sees h.p. overhead feeders supplying a quite uneconomic network of underground distributors in some small town or village, probably owing to the attitude of the inhabitants. The Commissioners continually point out in their reports the need for cheap overhead distribution and better wayleave facilities, remarking that, in making comparisions with other countries, there is a failure to recognise that rural electrification in Great Britain must be governed by British conditions.

In 1920-21 £15 millions was sanctioned for plant, mains, land, &c., of which £3 millions, or 20 per cent., represented mains and services; in 1929-30, out of a total of £18 millions, £8.4 millions, or 47 per cent., represented distribution.

A typical modern overhead-line network is the Norwich scheme, for which the contractors are Messrs. Johnson and Phillips. It consists of 112 miles of single- and three-phase lines, 11-kV, earthed neutral. Steel-cored aluminium, 7/12 copper-cored steel, and 7/12 steel wires are used. All lines are carried on wood poles, and spans vary from 450 to 525 ft. The use of V-crossarms avoids the necessity for bird-guards. No continuous earth-wire is used, but, instead, at each pole an earth-plate of long, narrow, shape is inserted in the pole-hole

Crompton Parkinson, Ltd.

An Unobtrusive Four-wire Line in a Country Lane

and connected to the ironwork. The pin-type insulators are designed for 1,000 lb. maximum transverse working load for straight lines and 2,000 lb. for angles. The e.h.p. switchgear, 334 single-pole fuses, and 15 t.p. gang-operated switch-fuses, will be manufactured by Messrs. Johnson & Phillips. The fuses will be of the new "N" type, which is of the expulsion type and consists of a heat-resisting glass tube containing a fuse of zinc wire in an internal insulating tube. This fuse is handled from ground-level by means of a pole.

Line Cost and Materials

Rural lines have been erected recently at as low a cost as £175 per mile for single-phase lines. Representative figures are 0.1, 3-wire, 3-phase, 11-kV, £375 per mile, excluding supervision and Post Office charges; No. 7, 40 per cent. "Copperweld" 3-phase, 3-wire, 11-kV, £205 per mile; 4-wire 0.05 copper, £420/£440 per mile; 11-kV galvanised steel, 3-phase, £400 per mile; 4-wire, 3×0.075 and 1×0.05 sq. in. copper, £400 per mile.

Many engineers still hold the view that line cost must come down to something of the order of £150 per mile before rural electrification can reach purely farming areas on an economic basis.

The tendency is all in the direction of longer spans, fewer supports, fewer leakage paths, the abandonment of the earth-wire, and such like economies. Copper is likely to remain at its present remarkably low price, making copper-clad steel and similarly arranged conductors economically attractive. It is improbable that very large economies will be effected in l.p. distribution lines, as the spans must be short and the conductors fairly heavy.

New Fittings

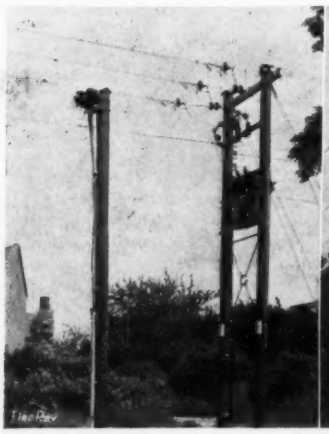
The Yorkshire Switchgear Co. has brought out a very useful combined service fuse and porcelain end-strain, which acts as a make-off for aerial services, and also includes a fuse suitable for pressures up to 750 V and capacities up to 100 amperes. It is secured by two wood screws.

The Edison Swan Electric Co.'s telephone-line protector has now had a fair test on various supply companies' systems. In one case, one the North-East Coast, a fault on a 66-kV system caused a heavy surge which brilliantly illuminated the protectors for over four minutes; the protectors were then found

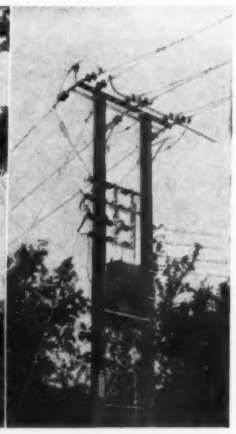
to be in perfect order, and had protected the telephone instruments efficiently.

This company also makes neon gas potential-indicators of a new type.

Messrs. Johnson & Phillips have introduced a new type of parallel groove clamp for use as straight-through, or tee, connectors on steel and copper-cored steel lines, and have just put on the market a new galvanised clamp for this purpose. Another of their new products is a square-shaped staple for securing creosoted-wood earth wire guards. Instead of screwing to the pole every 15 inches or so, only three staples are used, saving time and labour. Their "Wonpeace" insulator and "Juno" line-bracket have been used extensively on some



Crompton Parkinson, Ltd.
Outdoor Sub-station in Somerset



Johnson and Phillips, Ltd.
York Corporation 50-kVA Sub-station

dozens of large undertakings; also, their new "N" fuse was developed in the spring of this year for the Norwich scheme and similar cases of "small" electrification.

British Insulated Cables, Ltd., have brought out new "Copperweld" earthing rods, which are claimed to be non-rusting and to reduce labour costs.

Though not quite a recently developed fitting, the Matthews cut-out has recently been used in considerable numbers by several undertakings.

Standardisation and Design

There is a general tendency towards fewer component parts, greater simplification, and possible standardisation, though pole-top designs are still bewildering in number and variety.

Early this year the Cable Research Association brought out a book of standardised designs which represents a great step forward. A suggested standard specification was also discussed at a meeting of the Overhead Lines Association.

In general, attention has already been drawn to the frequency of 33-kV and 11-kV lines, longer spans, smaller sags, greater tensions, and shorter supports. Three specifications have been amended by the B.E.S.A., namely, No. 125 (hard-drawn copper conductors), No. 137 (porcelain insulators), and No. 215 (aluminium and s.c.a.).

In some cases distribution undertakings have developed designs for h.p. and l.p. lines on the same supports.

Supports

Concrete poles are being manufactured by the Ferro Concrete & Electrical Construction Co. at Chester. It is understood that a 29-ft. pole withstood a load of 4 cwt. after four weeks without any permanent set. The poles are sent out after two weeks, but the radius of supply, to compete with heavy-class wood poles, is only fifty miles.

Callender's Cable & Construction Co., Ltd., is erecting some of these poles in Cheshire districts.

At Mr. R. Borlase Matthews' all-electric farm at East Grinstead, X-shaped supports of sawn timber have been erected, a construction which, it is claimed, reduces the cost of single-phase 2,200/6,600-V lines to £70 per mile.

Copper-bearing steel has been used for light towers and for fittings in some parts of the country where corrosion is feared.

The Yorkshire Electric Power Co. has developed its "Yorkshire" mast, designed to do the work of a lattice mast while only occupying 2¼ sq. ft. or so of ground space. (This mast was described in the Electrical Review, p. 586, April 3rd, 1931.)

An interesting recent design of pole top is the Pirelli, consisting of a single length of channel iron, bent to shape, and clamped by two bolts.

Messrs. Painter Bros., of Hereford, recently produced the "P.B." pole, a light steel framework capable of withstanding transverse loads (to the elastic limit) up to approximately 13,000 lb.

The right-hand illustration on page 575 is an example of an inconspicuous 3-phase, 4-wire, 400/230-V distribution line, compared with the G.P.O. pole-line on the other side of the road; the conductors are attached to swan-neck insulators with 9 in. spacing.

One of the illustrations on this page is of an H-pole of the York Corporation. It carries a 50-kVA transformer with h.p. switch and fuse, and an l.p. fuse box. It is 38 ft. long overall, and 11.5 in. in diameter 5 ft. above the butt. The strain insulators are in duplicate on one side, with bridles and earthing, for a road crossing. The l.p. fuse box is bolted direct on to the transformer tank, thus saving pole straps and v.i.r. cleated cables, and protecting the top of the box from rain, so reducing the cost. The h.p. conductors are 0.05 sq. in. equivalent segmental s.c.a., and the spans are 480 ft. The l.p. conductors are 0.05 sq. in. copper.

Regarding cross-arms, there are still two schools of thought: one prefers straight cross-arms and bird-guards, and the other cross-arms of various shapes designed to avoid the use of bird-guards. From observations in various parts of the country it would appear that the second type is in the ascendant.

It is reported that the G.P.O. has been carrying out weathering tests for eighteen months on "Sherardized" objects. The results are not yet known. Several firms manufacturing outdoor switchgear now use "Sherardizing" exclusively for the protection of exposed ironwork.

Insulators

The most outstanding development is the upward tendency of voltages, lines now operating at 132 and 145 kV; this subject is, however, outside the scope of this article. Essentially, there is nothing new in insulator design. Owing to the steel-core conductor, with its increased strength and longer spans, insulators are now in use having a mechanical ultimate strength of 28,000 lb. on each disc. Some authorities favour suspension discs for 33 kV. There are, however, upwards of 100 lines operating in this country at 33 kV with pin-insulators. Opinions differ whether cement should be used in insulator design: cemented insulators have been in service for periods as long as twenty-five years. Many expert insulator-engineers

Ferro Concrete and Electrical Construction Co.
Reinforced-concrete Pole Construction

and designers consider that only a very few operating engineers understand the fundamentals of insulator design. Very few insulator line troubles have been experienced, relatively, in this country; to cure those which have occurred many remarkably shaped insulators have been suggested, but opinions differ as to their usefulness.

Glass insulators have made very little headway in this country, because they are mostly foreign products and, apparently, engineers are not satisfied as to the general properties of these insulators and their ability to comply with B.E.S.A. specifications. Many thousands of glass insulators are, of course, in use in France, including four-piece pin-insulators operating at 60 kV. Glass insulators may yet come into use

in this country, as it is understood that they can be sold at about half the price of the porcelain product.

On outdoor sub-stations economy of space and freedom from bird trouble is claimed to be attained by the use of " Pernax " as a covering for terminals, bus-bars, etc. This method of obtaining smaller clearances is a recent application of this material.

Conductors

Copper, aluminium, s.c.a., segmental-strand conductors, cadmium-copper, copper-clad steel, copper-cored steel, 7/12 galvanised steel, and " Copperweld," are in use.

Economic spans are: copper, 310-460 ft.; s.c.a., 365-465 ft.; segmental s.c.a., 395-510 ft.; cadmium-copper, 410-515 ft.; copper-clad steel, 490-535 ft.; copper-cored steel, 7/12, 525 ft., 7/12 steel, 535 ft. There have been cases of lines erected on A-poles with 620-ft. spans.

" Copperweld " rural lines have been erected to carry 50/100 kW at 11 kV, with spans of from 300 to 500 ft.

The most notable advance has been the advent of the segmental-standard conductor (described in the ELECTRICAL REVIEW, p. 282, August 21st, 1931). As this conductor is creating increasing interest, it may be presumed that the vibration troubles which might be expected to attend a smooth-surfaced conductor working at a high tensile stress on long spans have been overcome.

Sub-stations and Switchgear

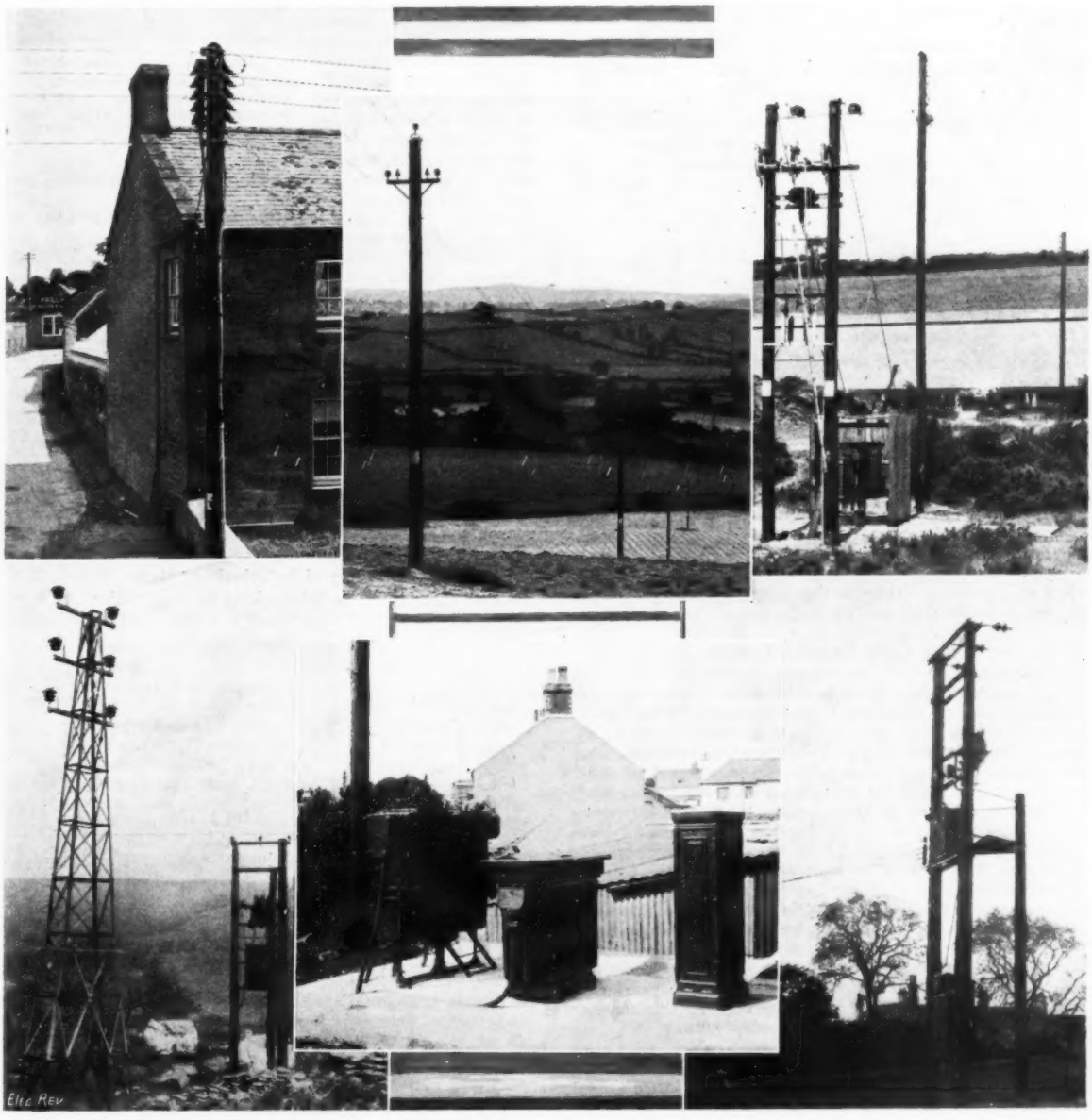
In general, simplicity is being aimed at. Oil-filled switch-fuse units and expulsion fuses are being employed for protection; in some undertakings single-phase and 3-phase transformers of the pole-mounting type have been standardised up to 25 kVA. Pole transformers up to 75 kW are now hung on H-poles. Where tappings are used, the tendency is for them to be entirely outside the transformers.

Makers seem to be concentrating on the production of standardised, simplified, easily maintained outdoor air-break switchgear and switch-fuses. Such gear is operated either by means of a pole, such as the Crompton Parkinson gear, or by swinging part of the structure downwards until the fuses are within reach, as in the Electric Control and Metropolitan-Vickers designs.

In the case of services, again, simplification and neatness are continually being improved. Callender's Co. has developed a system using " Kaleeco " and " Kalibond " cable carried by a catenary wire between blocks of houses, and the Macintosh Cable Co. has a similar system.

Acknowledgments

Acknowledgment is due to the engineers of a number of undertakings for data supplied, particularly Mr. C. T. Alan, of the South Wales Electrical Power Distribution Co., Ltd., Mr. R. J. Jocelyn Swan, of the Chesham Electric & Power Co., Ltd., the Ferro Concrete & Electrical Construction Co., Electric Transmission, Ltd., Croydon Cable Works, Ltd., Pirelli-General Cable Works, Ltd., Crompton Parkinson, Ltd., Johnson & Phillips, Ltd., and Bullers, Ltd.

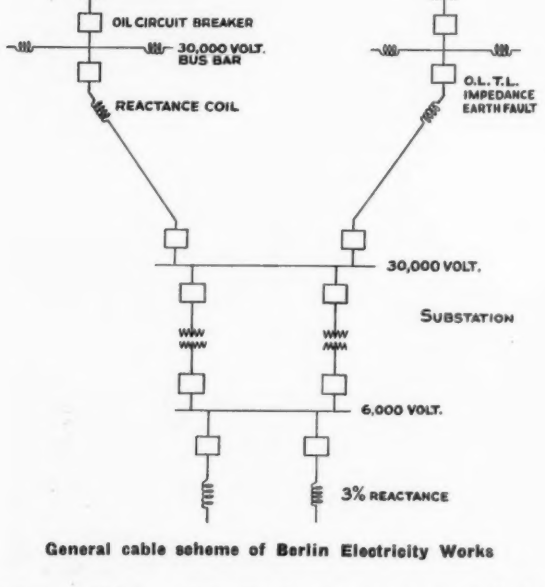


Top, left to right: Sectional Pole with Pair of Vertical Feed Boxes. An 11-kV Line in Somerset. An 11-kV Sub-station in Cornwall, l.p. P.B. Line crossing G.P.O. Lines (Crompton Parkinson, Ltd.). Bottom, left to right: Sub-station Tapped off Trunk Line (South Wales E.P.D. Co.). A 6.6-kV Sub-Station in Jersey (Crompton Parkinson, Ltd.). Terminal Pole Sub-stations (South Wales E.P.D. Co.)

Power Control. By Charles C. Garrard, Ph.D., M.I.E.E.

The Influence of the National Grid Scheme on Switchgear Design

WHEN it was first proposed to install an interconnected electrical system in this country of such a kind that the short-circuit current from a large number of power houses could be concentrated in one spot, it was held by some engineers that the problem was beyond the powers of switch and protective gear designers. Apart from the fact that the event is now proving the lack of foundation of such fears, it is interesting to recall that, at that time, the example of the so-called " loose linking " of the Detroit Edison Company was brought forward in support of the argument against the Grid proposals. While the loose linking principle has certain advantages in reducing the cost of switchgear, recent experience in the United States lends equal support to that upon which the work of the Central Electricity Board is based. There are, in fact, in the United States, three principles of power control employed which are represented by the systems in use in Detroit, New York, and Chicago, respectively. These are the " loose-linked " system at Detroit, the " synchronised at the load " system of New York, and the " close-linked "



General cable scheme of Berlin Electricity Works

system of Chicago. Naturally the last one gives, relatively, the largest short-circuit current.

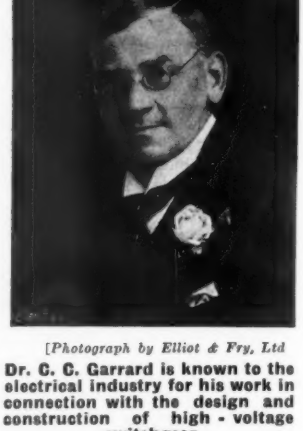
The Close-linked System

To deal with this, the Commonwealth Edison Company of Chicago has relied mainly upon the isolated phase construction which was first developed by that company. This system has been applied there recently to 66-kV outdoor switching stations. In these the 66-kV phase conductors are separated by a distance of 30 feet, and, moreover, in addition, a metal screen of generous proportions is placed between phases. Such arrangements as these have as yet not been deemed necessary on the British Grid, neither has the " fault bus " system as used in Chicago been used here. Experience here to this date would not indicate its necessity. Actually in Chicago the short-circuit current is kept within practicable limits by the use of reactors. It is probable that every large city system in the future will rely more and more upon artificial reactance to maintain the continuity of its supply. An interesting example of this is the system of Berlin Electricity Works, the general cable layout of which is shown above in diagrammatic form. The universal use of reactance coils in this manner allows an impedance (distance) protective scheme to be applied to the protection of all underground cables, no matter how short these may be. Distance relays are, of course, used on the British Grid, but only where the lines protected exceed about 10 miles in length.

The Three-switch Sub-station

An interesting recent switchgear development in this country has been the 132-kV three-switch sub-station installed so extensively by the Central Electricity Board. Hitherto, for the control of a sub-station containing two feeders and two transformers, four oil circuit breakers would have been considered necessary. A study of the diagram below will show, however, that the arrangement adopted secures a high degree of protection with the reduction in cost due to the elimination of one circuit breaker.

The same diagram further illustrates a system of key interlocks used with such a station to prevent inadvertent wrong operation. The Castell keys used each have a separate number embodied in their construction. Hence any particular lock can only be worked by its appropriate key.



[Photograph by Elliot & Fry, Ltd

Dr. C. C. Garrard is known to the electrical industry for his work in connection with the design and construction of high - voltage switchgear

It will be seen the sub-station comprises three oil circuit breakers and 12 isolating links (each, of course, 3-pole with phases coupled). The operation of the whole of these is rendered mistake-proof by the use of 40 locks and 18 keys. The whole of this interlocking (with the exception of a single bell) is mechanical. The interlocking conditions are enumerated as follows :—

Condition " A."—FL1 must not be opened or closed unless SOS and OS1 are open.

Condition " B."—FL2 must not be opened or closed unless SOS and OS2 are open.

Condition " C."—E1 must not be closed unless FL1 be open (or E2 unless FL2 be open).

Condition " D."—BP1 and BP2 must not be opened or closed unless SL1, SOS, SL2, together with OS1, TB1, OS2 and TB2 are closed.

Condition " E."—SL1 and SL2 must not be closed or opened unless SOS be open.

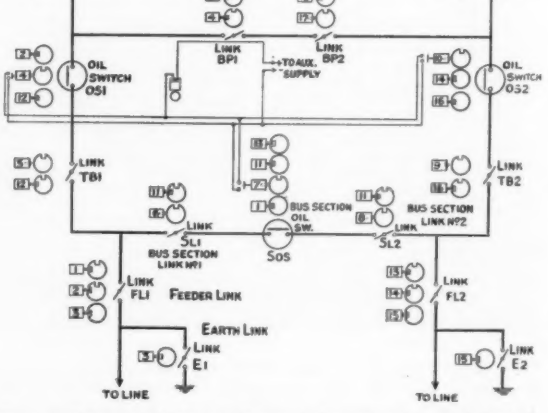
Condition " F."—TL1 and TB1 must not be opened or closed unless OS1 be open.

Condition " G."—TL2 and TB2 must not be opened or closed unless OS2 be open.

Condition " H."—BP2 must be open before TL1 or TL2 can be opened or closed.

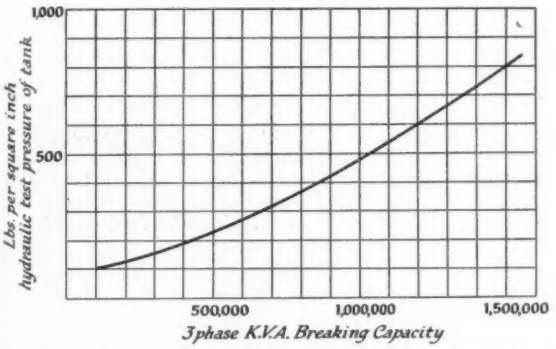
Operation of Interlocking Gear

As an example of the interlocking let us consider condition " A." If this one be understood it is not difficult to follow



Three-switch sub-station. General layout with interlocking diagram

out the remainder, as exactly the same principles apply throughout. The locks are indicated by small numbered rectangles. To simply matters still further, we will examine the interlock between the feeder link FL1 and the oil circuit breaker OS1; the interlock between FL1 and the section breaker SOS is precisely similar. The interlock between FL1 and OS1 is by means of the two locks (2) and a single key 2. Key 2 will of course only fit into lock (2). To start with, the key 2 must be in one of the locks (2), or it might be in the



Relation between kVA breaking capacity and hydraulic test pressures of metal-clad switchgear tanks

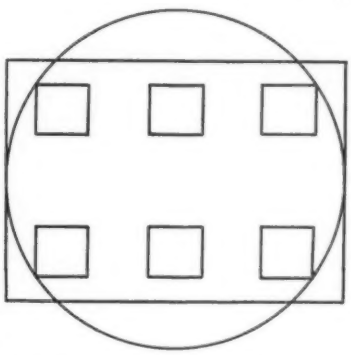
hands of the attendant. If the latter, what is the condition of OS1? It must have been locked open and for this reason. The locks are of such a construction that the keys can only be withdrawn from them when the lock bolts are shot out, viz., when the locks are locked. Now opposite each lock will be seen a slotted disc. These discs rotate with the associated mechanism (circuit breaker or link). In the diagram the positions of these discs are those they occupy when everything is open circuited. Consider lock (2) on OS1. If, when originally erected, the bolt of the lock were drawn back, this could only be the case if key 2 were in that lock. To withdraw key 2 from that lock the bolt of the latter must be shot, and this can only be done when the slot in the associated disc is in the position shown, which position is the one occupied when breaker OS1 is open. It will be seen, therefore, that the process of withdrawing key 2 from lock (2) on OS1 locks the latter in the open position. Key 2 can now be taken to the link FL1 and inserted in lock (2) there. Neglecting for the moment locks (1) and (3), key 2 unlocks (2) and link FL1 can be moved. Possession of key 2 can, however, not be obtained until link FL1 is again locked in its new position. All the other interlocks work in exactly the same manner. The most complicated is the by-pass link BP1. This must not be operated unless there is a complete alternative electrical circuit via the section breaker SOS. In other words, link BP1 must be interlocked with eight other pieces of apparatus. Therefore it requires eight locks as shown if full security is to be obtained. Mention might be made of the electric bell shown. This sounds when any of the three circuit breakers are locked closed, in order to remind the operator to unlock them again, after, of course, the by-pass links BP1 and BP2 have been closed and locked closed.

Secondary Switchgear for the Grid

The secondary switchgear for the Grid is mostly of the metal-clad compound filled type. Considerable developments have taken place recently with this class of switchgear. Originally solid compound was used and the internal connections were covered with mica or tape. This covering, however, necessarily occluded some air which tended to escape when the hot compound was poured in, with the danger of pockets occurring in the latter. This possibility of air pockets is ever present with solid compound. Consequently, recently the tendency has been towards the use of semi-fluid compounds. Ordinary transformer oil has been suggested. This has the disadvantage that it is slightly absorbent of moisture, and joints are difficult to maintain oil-tight. Both difficulties are obviated by the use of the semi-fluid compounds which are now available, and transformer oil need only be used for instrument transformer chambers where special precautions can be taken. Naturally somewhat more care is required in the handling of semi-fluid compound than the hard variety, as it is more easily contaminated by moisture and other impurities. Workshop tests, however, as to its purity are simple. Moisture, especially free moisture, can be detected by the so-called "crackle" test, that is by plunging a wire, heated to a red heat, into the compound. Freedom from crackle indicates dryness. The electrical breakdown test is, however, the most reliable, and is very easy to carry out. If a simple testing routine be followed before and during the filling operations, perfectly satisfactory results are obtained. These workshop routine tests will of course always be supplemented by laboratory tests if a tight hold on the source of supply of the compound is to be obtained. The latter will include the measurement of the power factor of samples of the compound; that is to say, the power factor of the charging current of a condenser formed by the compound is determined. Naturally, if the insulator were a perfect one, the power factor of such a charging current would be zero. If the charging current of such a condenser (made with the compound as dielectric) be I amperes and the measured power factor be cos γ, the test voltage being E, then the watts dissipated within the material of the test specimen are E I cos γ. Naturally the larger the internal loss the worse are the insulating qualities of the material. The value of the power factor is independent of the size of the test specimen, and, in fact, it constitutes a direct measure of the extent to which the material varies from a perfect insulator. It is especially the variations of power factor with temperature and other local conditions, and with time, which have to be closely investigated. The power factor varies of course with the electric stress to which the material is subjected during test. With a bad insulator, or one stressed beyond its safe limit, it will be found that, with prolonged application of the testing voltage, the power factor will gradually increase with time; constancy of power factor, no matter how long the test voltage be applied, is the criterion of excellence.

Influence of Operation on Design

In the detail design of metal-clad gear the tendency is to secure greater convenience of operation. For example, the former arrangement whereby it was necessary to move an entire circuit-breaker unit in order to inspect or renew the fuse of the potential transformer, is no longer acceptable. Current transformers must be easily removable for calibration purposes, this being especially necessary having regard to the high accuracy of metering required by the Central Electricity Board. Metal-clad gear upon which it is necessary to climb in order to carry out certain operations is looked upon with disfavour by the Home Office unless handrails and platforms are supplied. Several accidents have taken place due to men falling off when engaged in such work. Modern practice requires that all operations such as locking off spout shutters, fitting of earthing extensions, &c., shall be done from the operating platform level. Mention should be made here of the requirement that the earthing of circuits shall be done through the associated circuit breaker. It should of course be possible to fit the earthing extensions to the terminals of the circuit breaker without removing the latter from the framework.



Relative clearances in rectangular-tank and circular-tank three-phase circuit breakers of equal overall width

Considerable discussion has taken place recently as to the respective merits of round tanks and rectangular tanks for oil circuit breakers. The first criterion of merit of a circuit-breaker tank is its capability to withstand internal pressure. The necessary strength varies with the rated rupturing capacity. This relationship, as adopted in certain quarters, is shown in the curve on this page. Strength of tank alone, of course, is not sufficient; this must be combined with adequate volume and electrical clearances. Tanks of any shape can be made equally strong by suitable design, but there can be no doubt that, for three-phase single-tank circuit breakers of equal overall dimensions, the rectangular tank gives larger clearances than does a round one. The illustration of the two types superimposed makes this clear. This does not apply to single-phase breakers, i.e., to large three-phase breakers in which each phase is in a separate tank. For these the round tank is best from every point of view.

Nickel-copper Condenser Tubes

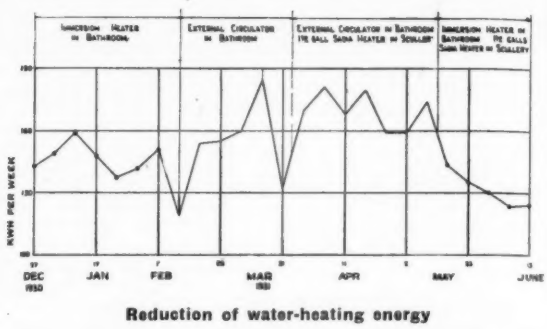
The *Nickel Bulletin* states that since tests of nickel-copper condenser tubes in 1908 proved that they were capable of withstanding the corrosive effects of River Tyne water, these tubes have been used in increasing numbers. The Newcastle-upon-Tyne Electric Supply Co., Ltd., in its Carville, Dunston, and North Tees stations, is using about 15,000 cupro-nickel tubes, representing a total length of 250,000 ft. In addition to these, the new Dunston power station will contain condensers fitted with 30/70 nickel-copper tubes to the extent of about 110 tons.

Domestic Electricity Consumption

Marked reduction results from the elimination of water-flow from bathroom to scullery

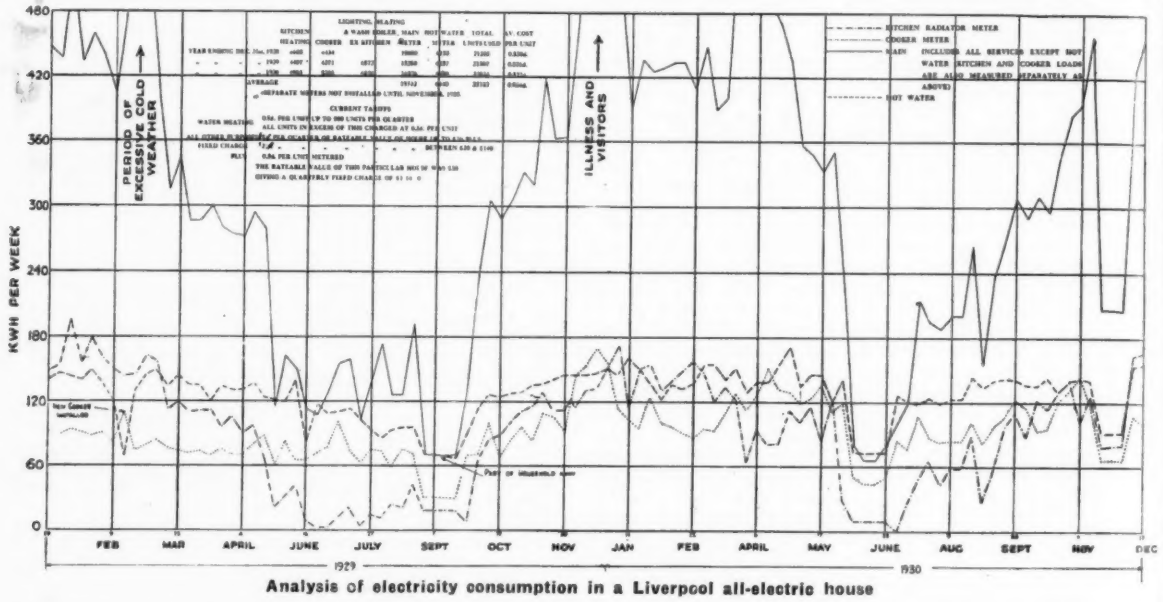
WE are indebted to Mr. P. J. Robinson, the city electrical engineer of Liverpool, for a chart, reproduced herewith, showing actual readings taken in the all-electric house of one of his consumers over a period of two years. Rather wild statements are made at times regarding what should be the consumption of radiators, electric cookers, etc., and these do not in any way help the electricity supply industry. It is therefore all the more advisable to consider actual consumptions, and the information given in the curves, etc., should prove valuable.

The house in question is rather an old-fashioned one, having two reception rooms and five bedrooms, and it was built from twenty to twenty-five years ago. The family consists of the householder, his wife, one child about four years old, a baby, and a maid. No coal or gas is used in the house.



Reduction of water-heating energy

The water-heating arrangements are of particular interest During the period shown in the chart all the water heating was carried out by an immersion heater in the main cylinder in the bathroom, this being controlled by a thermostat. The scullery hot-water tap was approximately 30 ft. away from the cylinder, and it was felt that there was a considerable waste of heat due to this arrangement. In the early part of 1931, therefore, further experiments were carried out, and the result of these is shown in the smaller chart. The first change took place about February 14th, 1931, when the immersion heater was replaced by a thermostatically-controlled external circulator heater, and it will be seen that the consumption tended to increase. About March 24th a 1½-gal. Sadia heater was installed in the scullery, this being thermostatically controlled and so arranged that only about 12 in. of outlet piping was necessary.



Analysis of electricity consumption in a Liverpool all-electric house

It was still felt that the consumption was higher than it should be, and that this was probably due to the external circulator in the bathroom not being very efficient. This circulator was then taken out and the original immersion heater re-installed, and it will be seen that the tendency was for the consumption to be much lower.

It is sometimes suggested that an all-electric house needs skilled attention, and it is therefore interesting to note that the consumer in question states that no troubles have been experienced by him with the features which are peculiar to the all-electric house, except for occasional failures of hot plates, which have always been put right within two or three hours of a telephone message being sent to the Electric Supply Department. On the other hand, troubles have admittedly occurred in that part of the equipment which is found in practically any modern house of similar size, namely, electric irons and vacuum cleaners. Manufacturers have not yet produced a satisfactory connector for the flexible wires necessary for these pieces of apparatus, and it is suggested that this is a matter which should receive careful attention.

Part view of 1,000,000-kVA breaking capacity, 33-kV metal-clad switchgear, showing separately lowered potential transformer (*See preceding pages*).

An Ambitious Soviet Scheme.

An ambitious scheme for heating the whole of Moscow by electricity and supplying factories and houses with hot water by the same means has been approved by the Moscow authorities. It is estimated that when the scheme is completed, a saving of 2,000,000 tons of fuel will be effected annually. According to the plan of Professor Tannenbaum and Rozanov, an engineer, ten central stations, totalling 1,350,000 kW, will be employed for these purposes. The five existing stations, according to *Pravda*, will be supplemented by five new stations, the plans for which must be submitted by November 10th.—*Reuter* (Riga).

Power Station Operation. By S. A. Russell, A.M.I.E.E.

The Power Stations Engineer of Manchester Corporation Electricity Department makes a few suggestions for securing the highest possible efficiency, and emphasises the importance of cleanliness

CORRECT fuel weight is the base upon which to build successful operation. The accuracy of the weighing machines should be beyond question, and to secure this regular testing of each machine is essential. It is well worth while to contract with the weighbridge manufacturer for their periodical inspection and testing.

Fuel should be selected, particularly if the station is designed for both pulverised-fuel and stoker firing, with a view to reducing subsequent combustion troubles to a minimum. It is essential to have a chemical laboratory of ample size, staffed with experienced chemists, to assist the engineers. I have been associated with the growth of three power-station chemical laboratories, and cannot speak too highly of the valuable assistance given in all sections of the works by the chemists. Their work consists of the analysis of fuels and ash, control of the boiler feed water, the testing of oils, metals, refractories, insulation, paints, &c., and treating corrosion troubles.

It is extremely important for the engineer to have accurate fuel data. With correct weight must be associated accurate calorific value determination and analysis of the ashes for unconsumed matter.

Coal Sampling

It is not proposed to discuss methods of coal sampling in this article, but it may be noted that the B.E.S.A. has issued a publication dealing exhaustively with this very difficult problem, and it is urged that all stations should follow these recommendations. Ash sampling is, perhaps, an even more difficult business, and a man should be properly trained to sample both fuels and ash correctly. For the completion of the boiler-house heat-balance, which should be prepared every week, complete analysis of the fuel is necessary. The boiler-house engineer must pay very close attention to the heat-balance, for it is the record of the operation of the plant under his control. All samples of fuel should be tested both in the laboratory and in the boiler-house for combustion characteristics.

The chief factors affecting successful boiler-house operation are:—(1) Cleanliness of the unit; (2) furnace and draught conditions; and (3) loading of boilers.

With regard to the first, neither the boiler plant load factor nor efficient operation can be maintained if the plant is not kept clean, both internally and externally. The internal cleanliness of the tubes and drums depends upon the water used and its treatment. This is almost entirely a matter for the chemical department and, to a competent staff, will present few difficulties.

Feed Water and Soot-blowing

The oxygen in boiler feed water has been, and probably is now in some stations, responsible for a loss of reliability, but with the advent of the closed feed system and centrally ported pumps this trouble is being reduced to a minimum. Daily samples of the feed water should be taken from various stages of the system, and the reason for any appreciable increase in oxygen content should be ascertained and rectified as quickly as possible. The turbine-house operating staff should be instructed in the necessity for reducing the oxygen content to as low a value as possible, for they can, if their interest is aroused, do more than anyone to see that, hour by hour, no air is being drawn into the system.

The external cleanliness of the tubes and heating surfaces must be maintained, and, although the modern method of soot blowing is effective up to a point, the furnace conditions, such as temperatures at certain boiler outputs and draught drop across the various passes, should be closely watched to ascertain the length of time the boiler can be operated before requiring hand cleaning. A good average time to allow between hand cleaning operations is about 600 steaming hours, but no doubt this period will be greatly increased with the boilers of the future.

The heat transmission of the boiler units can be seriously disturbed if the condition of the absorption surface and heating area presented do not conform to the original design. Even if the surface conditions are good, broken baffles and infiltration of air can considerably reduce the normal efficiency of the unit. A drop in CO_2 or variation from the normal temperature throughout the boiler indicates defects, and it is far better to be constantly vigilant regarding the losses than simply to make occasional efficiency tests.

The conditions prevailing throughout the plant should be known at *all* times, and, although opinions may vary as to the utility of a number of so-called "essential" instruments, there is no doubt that, in order to operate at the highest possible thermal efficiency, reliable meters and instruments must be installed and the readings taken at, say, hourly intervals and truthfully logged. The logging of individual boiler-water and gas temperatures, draughts, CO_2, &c., appears to some to be an unnecessary refinement, involving additional labour and expense; nevertheless, where such records are kept they are valuable for comparison with data previously obtained. In all sections of the works the thermometers, gauges, and other instruments should be calibrated against standard apparatus at frequent regular intervals.

The Operation of Boilers

Boilers should always be capable of giving their rated output. It may be argued that efficient results can be obtained with easy loading, but a well-kept plant will give the best overall boiler-house efficiency when operated at a high load factor. A boiler house with a low load factor may cause excessive losses due to banking and raising pressure. Banking may cause serious loss if the dampers and boiler casings are not kept tight.

The closest attention must be given to all factors from the inlet air to the chimney base, from the coal bunkers to the ash pits, and to the regulation of air at varying outputs and possible variation in fuel. Boiler-house engineers should post a diagrammatic chart showing the temperature prevailing at several selected points under clean conditions of the plant, and at varying loads and average CO_2.

At all opportunities the operation of a station should be examined from the exterior. Quite a number of faults in operation show up clearly outside the works, the two principal ones being the emission of black smoke, and escaping steam. An intelligent interpretation of what is seen outside is as helpful to efficient running as what is seen inside the station.

In stations where load fluctuations are not more than, say, 5 per cent. during the morning and afternoon the regulation can generally be performed on one boiler, whilst the others are kept at a constant steaming rate. A critical steam pressure gauge mounted in a prominent position in the boiler house, with a summation load indicator by its side, serves admirably to guide the operating staff in maintaining a steady steam pressure. Automatic boiler-house control has been tried in a number of plants with a measure of success, but a well-trained staff is useful in the event of unforeseen circumstances, which will occur in the best-regulated boiler houses.

With pre-heated air and stoker-fired boilers particular attention must be given to the linking of the grates to allow for the growth of the links. If linked too tightly, grate failures will result and difficulty may be experienced in maintaining the output of the boiler, due to the limited air spaces being filled up with fine particles of slag and the consequent possibility of a considerable amount of unconsumed matter running over the back.

Where soot blowers are used, constant attention must be given to the adjustment of the blower elements, to prevent damage to the tubes, and to ensure the best results. The draught over the fire should always read a negative pressure, so as to lengthen the life of the refractories.

In the Turbine House

Although it is true that what is lost in the boiler house cannot be regained in the turbine house, it is equally true that what is gained in the boiler house may be lost in the turbine house by inefficient operation. It is well to remember that 1 per cent. gain or loss in the turbine house efficiency is, approximately, 1 per cent. gain or loss in the overall thermal efficiency of the station. Something to worry about at the works keeps one always tuned up and in constant touch with every part of the plant, resulting in efficient operation.

Each turbo set should, whenever possible, be loaded to its most economical rating. As in the boiler house, the turbine operating staff should at all times be familiar with the temperatures and pressures throughout the plant. The regular logging of steam, water, and oil pressures and temperatures, and air temperatures will often give a hint when things are going wrong. If the hint is taken, serious breakdowns of plant may be avoided. It is, of course, necessary at all times

to keep the absolute pressure at the exhaust as low as possible consistent with the load upon the turbine and the temperature of the circulating water.

Condensers

Condenser tests should be taken systematically, and the results plotted against a datum line, the datum line being the condenser performance curve usually supplied by the makers and probably proved by the acceptance tests. The source of circulating water will often determine the intervals between cleaning operations. As the intervals are more or less seasonal, frequent condenser tests are very important; it is a good arrangement to have a two-point recording thermometer chart, one point recording the exhaust steam temperature and the other the circulating water outlet temperature; the difference between the two readings gives a clear indication of the condenser condition. Dionic tests for condenser leakage should also be carried out regularly.

Every endeavour should be made to keep the quantity of feed water make-up as low as possible, because the make-up generally represents steam losses which will have a marked effect upon the station efficiency. Water leakages can be easily collected and returned to the system; a further 1 per cent. reduction in the make-up by preventing steam leakages will raise the overall thermal efficiency of the station by, approximately, 1 per cent.

Attention to Idle Plant

Plant when temporarily out of commission should receive just as careful attention as when running, and the stop-valves and by-pass valves must not leak. The turbine cylinder and steam pipe drains should be open-ended, and every precaution should be taken to prevent steam from any other source passing back through drains to the turbine. More damage can be done to blading, glands, and packings in a few hours of careless standing than during months of running.

The critical times in the operation of steam turbine plant are undoubtedly at the running up and shutting down. The regulations supplied by the plant manufacturers should be followed to a large extent. Every piece of machinery, however, has individual characteristics, and the behaviour of one turbine, say in running up, is not identical with that of another of the same make and size.

Oils should be tested at fairly frequent intervals for demulsification properties and free acid, and, in the case of transformer oils, for dielectric strength.

It cannot be too strongly urged that particular jobs should be given, generally, to particular men, who should be held responsible for their being carried out.

Regular Turbine-house Tests

Vibrometer tests should be taken on each bearing of the turbo sets every week, and records kept of the result. These records are valuable because opinions vary so much as to the extent of the vibration—whether it has remained normal or becomes better or worse—if judged only by sense of touch.

The measurement of the insulation of the generator rotors at speed is as necessary as the usual insulation tests for all generators and electrical apparatus. In stations where no such test is made the engineer responsible should start at once to keep such a record. It is quite simple to take the voltage to earth from each slip ring and the voltage at the same time across the rings, whilst the set is on load. Should a definite reading to earth be obtained, steps should be taken at the first opportunity to locate and remove the fault.

The Importance of Auxiliaries

Past years have taught us the vital necessity of maintaining an auxiliary supply through all likely troubles. To lose the vacuum, for instance, or the works lighting during a shutdown, very seriously handicaps a quick restoration of supply. Most stations now have three or four auxiliary supplies, *viz.*, house-service generators, transformers, motor-generators, and batteries. The sub-division of the auxiliaries must be so arranged that the failure of any one section will not affect another, and that the unaffected section will be sufficient to keep the main plant operating until the supply has been restored. Generally, the only steam-driven auxiliary in use in a modern station is the feed pump, and even here the steam is standby to the motor-driven pump. It must not be possible to couple the auxiliary supplies at any point remote from the switchboard and, in any case, the bars should be coupled only in very extreme emergencies; otherwise the whole object of division may be defeated.

It is not worth while to endanger the continuity of the main supply for the sake of reducing the percentage works kWh with the object of increasing the overall thermal efficiency on feeders. Thus, it is the general practice to install two circulating water pumps to each main set, each pump being capable of supplying sufficient water to enable the main set to carry 60 per cent. of its normal rated capacity. If one set is running alone during the evening and night shift, even if the load is lower than 60 per cent., two circulating pumps should be kept running, as if one circulating pump were to fail the vacuum might be lost and the l.p. end of the turbine would become very hot, necessitating the shutting down of the set.

Whereas two circulating pumps are operated when the set is working at full load, only one condensate pump and one air extraction plant are normally necessary for the turbine up to overload rating, as the failure of the condensate pump or extraction plant is nothing like so serious as the failure of the circulating-water supply. Gauge glasses extended beyond the level of the vapour box have proved of great service in indicating the reason for a falling vacuum, and in demonstrating, when the condensate pump has been replaced in service, that it is dealing with the excess water. By this means, also, the attendant is enabled to regulate the loading of the pump.

Attention to Brush-gear

A point to which sufficient attention is rarely given is the pressure applied to the brushes of d.c. generators and motors, and of a.c. generator slip rings.

Unsatisfactory running of exciters, for example, can nearly always be explained by too much pressure on the brushes.

It is surprising that manufacturers should not have put more thought into brush-holder design; it is difficult with most of the holders supplied to maintain a constant pressure from a new brush until the brush is worn right down. The general fault is that when the brush is new, the pressure cannot be reduced to anywhere near that required for correct operation.

The station staff should therefore vary the springs, or other pressure devices, until good running is obtained with the least possible pressure upon the brush, and see that this pressure is maintained throughout the life of the brush. Before correcting the brush pressure it would be advisable to true-up the commutator.

The Scope of Control

Control-room operation does not begin and end in the synchronising, and later, the switching off load of the alternators; it involves constant and close attention to the maintenance of correct frequency, efficient loading of the sets, feeders, and bus-bars, the disposition of idle current, the introduction or short-circuiting of reactors between bus-bar sections, and the logging of all electrical data for alternators, transformers, feeders, &c. Nearly all stations keep very elaborate logs of the switchboard, but it is, perhaps, more important that this elaboration shall be carried out in the boiler house and turbine room.

Protective Gear Inspection

Generator and feeder protective gear should receive regular and skilled attention to guard against failure of operation when a fault occurs within the protected zone and, what is just as important, to guard against its operation by faults outside the zone. The stability of the gear under fault conditions outside, and the operating value of the relay in the case of fault conditions inside the zone, should be checked, preferably, by primary current, using one of the main generators for the purpose.

To guard against earth faults on the d.c. trip circuits of the oil switches, two lamps may be wired in series across the supply, with the centre point between the lamps earthed. The voltage of each lamp will be the voltage of the trip circuit, so that, normally each lamp will be at half glow, but the occurrence of an earth fault will cause one lamp or the other to become fully illuminated.

Where indicating lamps or other arrangements are provided to show switch or link positions, it must not be assumed, if the indication is not given or is contrary to what is thought it should be, that the lamp is burnt out or the gear not functioning correctly. The operator must make sure; it may save a very serious accident.

Instrument Reading and Recording

The readings which have been taken throughout the day in the boiler house, turbine house, and control room should be averaged, and the results carried forward to a weekly sheet, from which all figures will be taken for the compilation of the weekly statistical reports to form the basis of the monthly and annual statistics.

The giving of statistical information to the principal members of the staff throughout the works and the display of the different shift performances in the form of curves is strongly recommended.

Finally, it is suggested in all seriousness that the sure foundation upon which to build a highly successful power station is cleanliness and tidiness. The staff cannot be too exacting in its demand that the station shall be kept clean.

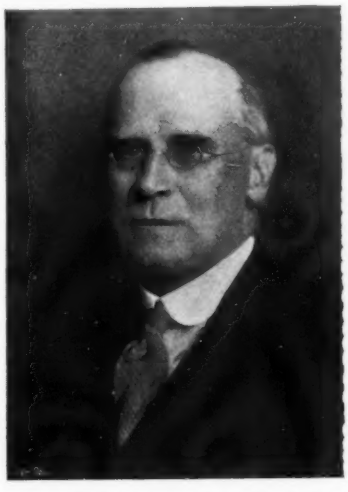
Electrical Trade and the Crisis. By H. C. Siddeley, M.I.E.E.

The author advocates a policy of united action in Overseas Markets

WE are now engaged in reconstructing our national ideas and reviewing our preconceived notions about almost every subject which has any bearing on the prosperity of this country.

In the general reconstruction, there is one conviction, which has been accorded first place throughout, viz., the necessity of bringing back prosperity to our industries. At last our politicians have recognised the relative positions of Industry and Finance, whereby the latter is taking its proper place as being entirely dependent on the well-being of the former.

For the present, the first tendency is to restore the balance of trade by restricting imports. Although this may be immediately necessary in order to improve our product capacity and efficiency, it cannot be accepted as the only way of restoring to Great Britain her pre-eminence among industrial countries.



Mr. H. C. Siddeley, the author of this article, has had considerable experience in the marketing of British goods in many parts of the world

A reduction of imports always results in a corresponding reduction in exports. This reduction of imports must be applied in the first place to those products which can be manufactured here with the present facilities and which involve the greatest degree of skilled labour for their production.

In this class the electrical industry is paramount, as almost all its productions come under this classification. This will be the first important step, as it will immediately increase the turnover of the manufacturers, and will bring down their costs of production to enable them to compete more successfully in the foreign market. By these same circumstances our foreign competitors will be correspondingly handicapped, in that their turnover will be reduced and their costs increased.

It is therefore important that special consideration should be given to the improvement of our export business, and those industries in which exports are of great importance must take steps to see how this can be achieved.

Apart from the question of production, in which direction our manufacturers have very little to learn, there is the very important one of marketing our products.

In the electrical industry we have four large manufacturers who cover a complete range of products. But there are many others who each cover only a limited range. Of the four large firms, two are definitely associated with foreign interests, and so their export policy may not be entirely without restrictions. The other two are sufficiently large to enable them to carry on their export business through their own branches established in all important foreign and colonial markets. Of the others, most of them have to depend on agents, who represent several other manufacturers, which in some cases are not all British.

The B.E.A.M.A. at home has been able to exert its influence in maintaining a balance between these several competing units, enabling each to pursue its own policy, but modifying it where the interest of the industry as a whole was concerned.

This same influence and effort is required in the chief foreign markets. In these we find the representation of the British electrical manufacturers divided up into small interests, which, in addition to competing against foreign makers, often find themselves competing against each other.

We find further that the American and German competition is concentrated in the hands of two companies in each country, the turnover of each of which represents the major part of that country's exports. Each company is able to maintain a large organisation, viz., staff, offices, and showrooms in each country, and internal competition can thereby be more easily avoided. So long as the representation abroad of British manufacturers is so divided, some unifying influence is required, so that a collective effort can be made to compete on equal terms with the efforts of these large foreign organisations.

To do this successfully, action can best be taken through the Manufacturers' Association operating in the foreign country itself.

It would appear, therefore, essential to establish a branch of the Association in each large importing country, which can perform the same functions abroad that have been done successfully at home.

Through this branch, concerted action can be undertaken to the general improvement in turnover, in prices realised, and in the avoidance of much unnecessary expense. Influence can be used for the adoption of British standards. Propaganda and advertising can be undertaken through the same source, which would collectively be much more effective than if the same amounts were spent separately by the individual agencies.

It would also be possible to arrange for a permanent display in central showrooms of British products, which would be much more effective than the separate and smaller displays of these products in the agents' showrooms, which are seldom well situated for an effective display, where an appeal to the general public is required.

The value of the exports of the Electrical and Allied Manufacturers in 1929 was £22,000,000 per annum, the chief markets being India, Australia, South America, South Africa, New Zealand, and Canada.

The values of electrical goods, apparatus and electrical machinery exported to these several countries in 1929 and 1930 were as follows:—

	1929.	1930.
	£	£
India	2,992,052	2,548,886
Australia	3,354,432	2,510,917
S. America	2,265,928	2,281,996
S. Africa	1,338,119	1,352,107
N. Zealand	923,477	974,910
Canada	556,988	749,741
	£11,759,106	£10,708,610

These figures relate only to the purely electrical exports, and do not include the value of the exports of boilers, steam engines and turbines, steam auxiliaries and oil engines, which are so closely allied with the electrical industry.

To maintain this trade and to increase it, is surely worth a strong effort, the success of which will have an important direct effect on the economic position of this country. It is the increase of exports, for which we should strive, which is the only policy worth while for a country of Great Britain's importance.

The cost of maintaining branches of the B.E.A.M.A. in the most important centres would amount to a very small percentage of the total turnover, as one quarter of one per cent. on the above total would bring in £55,000. This would be more than sufficient to maintain an adequate organisation in each of these important centres.

Many industries are looking for a lead as regards the export business, and the electrical industry through the B.E.A.M.A. is in the best position to initiate a definite policy, which can be followed by other industries to the mutual benefit of all.

Indian Cable Co. Seeks Protection

The Indian Cable Company, Ltd., Calcutta, has presented to the Indian Tariff Board its evidence asking for protection for its industry. In the first place, the company desires that the import into India of flexible cords and low-grade cables shall be prohibited unless some prescribed tests are passed. If this is not feasible the company asks for a specific duty which would affect inferior articles and high-grade ones equally.

Owing to the competition of rubber-insulated cables of less than 1/80th sq. in., the company has been faced with the alternative of either reducing its quality and price or ceasing to manufacture them. It is maintained that some protection, in addition to the 5 per cent. now levied, is necessary to help the industry against rapidly increasing Continental competition.

As regards uninsulated conductors, the company has demanded a 20 per cent. *ad valorem* import duty, or alternatively a specific duty of Rs. 6-8 per cwt. on uninsulated copper wire and strand and 28 per cent. *ad valorem* on other uninsulated conductors and weather-proof braided aerial wire and cables of over 1/80th sq. in.

It is pointed out that the rate for electrolytic wire bars is £57 per ton, and the c.i.f. price of wire approximately Rs. 31 per ton, so that the protection now given only amounts to Rs. 3-2 per cwt. It is not profitable for any company to produce in India under these conditions.

A Review of Appliances and Fittings

Fires
Water Heaters
Cookers
Lighting Fittings

Electric Fires

A Wide Variety of Design and Construction

ONCE again the manufacturers of electric fires offer an almost bewildering choice to the public, and the retailer must be hard put to it to decide which of the multitudinous variety he shall stock. He needs guidance, and to this end we have selected from a mass of information sent us by manufacturers forty examples of the latest fires available.

These must be considered merely as typical, for the number of new fires is too great for exhaustive treatment. It must also be said that they are additional to designs brought out in previous years, the bulk of which can still be obtained.

We are of the opinion that electric fires are bought by the public mainly on their price and appearance. It is against our policy to publish prices in our editorial pages, and therefore we rely chiefly on the pictorial method of presenting them to our readers.

Manufacturers, aware that the public is slow to respond to revolutionary changes in design, have, generally speaking, confined their attention to the improvement of models of a more or less familiar nature. Nevertheless, there are, as usual, several striking departures from accepted principles.

"Modern" Types

Among these we may point to the "Modern" fire produced by Belling & Co.—fig. 14 in the ensuing pages. This, in consonance with its name, is without ornament, relying for its effect upon line alone. The makers state that "the heating elements are completely concealed, but when switched on represent an opaque mass of glowing heat." The fire is finished in chromium plate. The modern touch is also discernible in the Jackson fire, illustrated by fig. 32. This is produced in vitreous-enamel two-colour schemes and in three sizes. The new "Inventum" fires (figs. 4 and 10) also possess severity of line, but are not ugly. The latter fire, particularly, combines utility with a handsome appearance. These fires embody small trough reflectors with spiral elements. The Revo Co.'s "Regent" fire (fig. 30) is also of simple design on modern lines. A number of other models illustrated show this tendency.

In its "Equator" (fig. 21), the Credenda Conduits Co. presents an "all-round" fire of novel character. The idea is not entirely new, but the way in which it has been carried out is, we believe. This is a type of fire which can be placed in the centre of a room, a position which has much to recommend it; it is hexagonal, with heating elements in each face.

Ferranti's have produced several varieties of their efficient parabolic-reflector fire. One model (fig. 19) is designed for fitting into a fireplace or other recess with the face flush with the surrounding wall—a very suitable way of placing a fire of large dimensions. Another (fig. 39) is provided with a bracket by which it can be attached to a wall. This, apparently, is meant for use in the bathroom, where it can be fixed out of reach.

Models specially designed for bathroom use are available from a number of makers. We illustrate two—one by the General Electric Co., Ltd. (fig. 5), and the other by the Arora Co. (fig. 27).

Imitation-coal Fires

To meet the requirements of those who, while desirous of changing over to electric heating, still retain a longing for the glowing coal fire, many new imitation-coal models have been put on the market. The pioneer company in this direction—Berry's Electric, Ltd.—has several new designs. One of these, the "Newberry" (fig. 13), is a combination of the standard bar-type fire and the imitation-coal model; the other, aptly called the "Insette" (fig. 26), is intended to fit into a fireplace, and is supplied either in metal or colour finishes.

Belling & Co. also have a new fire which combines imitation glowing logs with a radiant bar heating element (fig. 1). The latter is fitted beneath a canopy which is said to promote the circulation of air and assist in heating a room by convection. In the "Flicker" fire made by Chas. Joyner & Co. (fig. 6) the bar element is fitted below the "coal" and the latter is situated in a well, formed by a reflector back. A trivet top is provided. Another "Angelus" fire, the "Boudoir" pattern, shown in fig. 37, has a stainless steel back of rather novel shape. A flickering device is fitted in the "Gem" fire, produced by Falk, Stadelmann & Co., Ltd. (fig. 8), and the same company is responsible for the handsome Tudor design shown in fig. 3.

Carron Company is the maker of the imposing Georgian fire depicted in fig. 15, which is also of the imitation-coal pattern. This is supplied in highly polished "Carronium" alloy with a pierced and engraved steel fret. This company, too, has produced the very different model seen in fig. 9, a portable fire of simple construction. Other imitation-coal fires illustrated are the "Night Moth" and the "Canopic" by Electric Fires, Ltd. (figs. 22 and 34). The first has an aluminium reflector; in the other the heating elements are mounted in the front of the fire, on either side of the "coal," in such a way as to make them a part of the design. The "Tricity" imitation-coal fire (fig. 38) has the "fuel" banked rather higher than usual, while the heating element, of the spiral type, is fitted in a semi-cylindrical reflector in front of which is a small canopy.

The Hotpoint Electric Appliance Co., Ltd., has produced an attractive range of "Trilite" imitation-coal fires; these were shown for the first time at this year's British Industries Fair. There are six distinctive "period" models taking the form of dog grates surmounted by polished copper reflectors.

Miscellaneous Models

Best & Lloyd, Ltd., obtain their flickering-fire effect in a different way. The rays of an electric lamp are passed through bubbling water on to a "rippled" back reflector, and in some models through tinted "rippled" glass. Examples of these are shown in figs. 20 and 28.

Among the fires which rely mainly upon their general lines for their attraction is the "Magnet" fire shown in fig. 12. This has a simply constructed body with a minimum of ornamentation. The three radiant-bar elements are protected by a neat wire fan-shaped grille. Of similar character is the Siemens "Victor" fire, illustrated by fig. 25; this is of the hammered-copper reflector type, and it also relies for its effect on simple metalwork. Another "Siemens" fire of plain but handsome aspect is the "Chiltern," shown in fig. 11, which has three curved bars mounted horizontally.

There is little ornamentation in the "Efficient" fire by Veritys, Ltd. (fig. 7), which is a dual type combining the plain radiant bar with a hidden element mounted at the foot of a reflector back. The rear element is fitted with a guard and trivet upon which utensils may be placed; there is also a plate-warming trivet at the top. The Edison Swan Co. is responsible for a further fire of this general type. Fig. 29 illustrates this model, which has a hammered-copper reflector and a wire grille protecting the element.

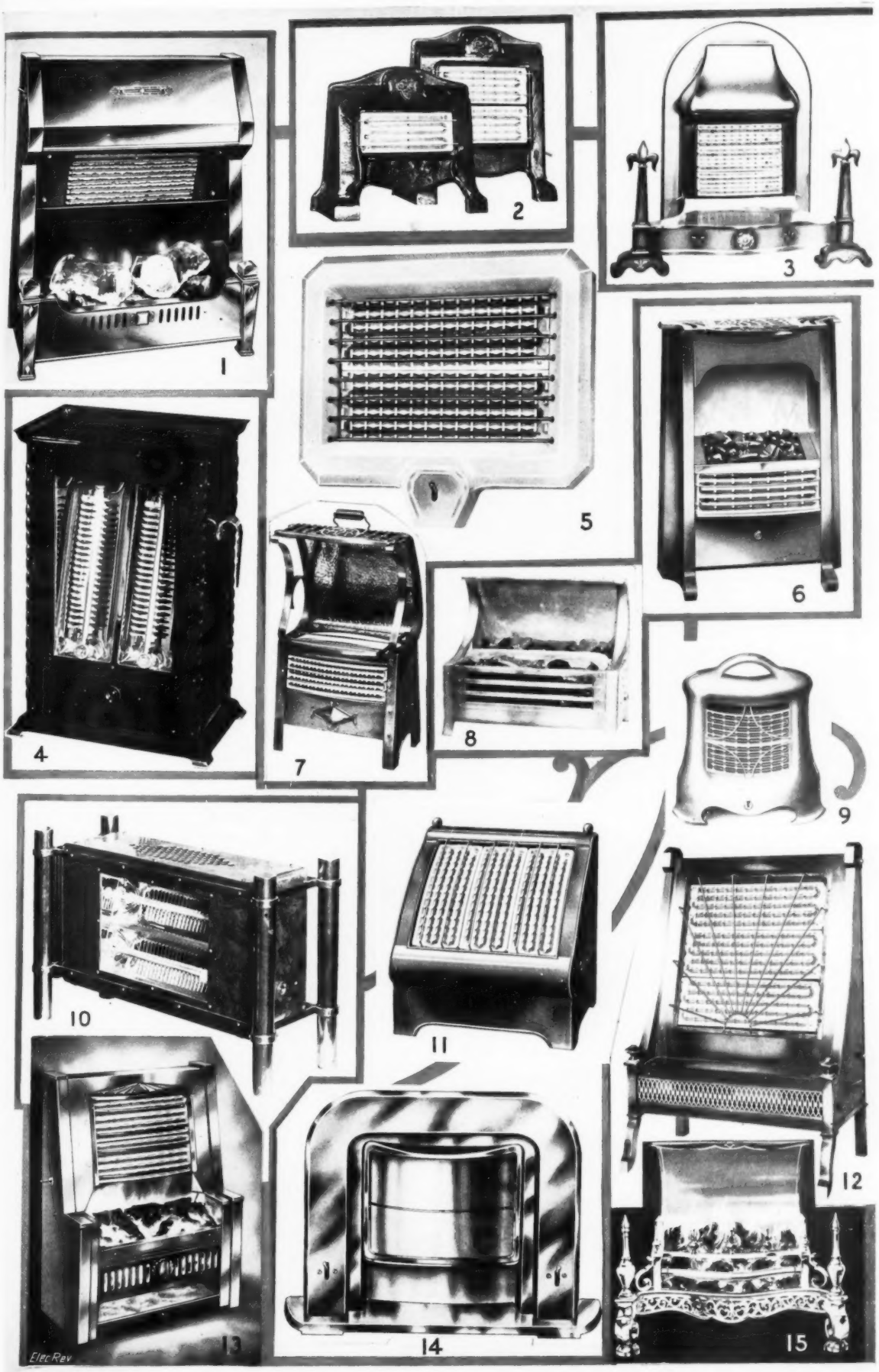
Utility Fires

Many even simpler models are available, and a few of them are illustrated. Attention may be drawn to the "Verriot" models by Berkeley & Young, Ltd. (fig. 2). These are substantially constructed and bear little ornament. The Sullivan "Invicta" fire seen in fig. 33 is also of robust appearance, and has a plain line and simple decoration. Fig. 36 shows one of the "Redot" fires supplied by Lighting Trades, Ltd.; this is constructed of sheet metal with an oxidised-copper finish. The most severe in general appearance is perhaps the G.E.C. model shown in fig. 23, but the severity is relieved by the plinth and the treatment of the top.

A recent entrant into the electric fire field is the Carborundum Co., whose adjustable "Solaray" fire, fitted with "Globar" (carborundum) elements is illustrated in fig. 17. Fig. 35 shows a fire (by Girlings, Ltd.) which is of simple character but somewhat novel.

The new bowl fires include that marketed by Lighting Trades, Ltd. (fig. 24), and the one produced by Premier Electric Heaters, Ltd. (fig. 40). The latter, known as the "Reflex," has a copper figured reflector, fitted with a correctly focused spiral element, mounted on a firm cast base finished in veined copper and brown. The bowl has a diameter of 11¼ in., and can be supplied with a chromium-plate finish.

We may conclude by mentioning the "Primo" diffuser (fig. 31), sold by the Sun Electrical Co., Ltd., in which a small fan placed behind the heating element gently impels warm air into a room.



1 and 14. Belling & Co. (" Lounge " and " Modern "). 2. Berkeley & Young, Ltd. (" Verriot "). 3 and 8. Falk, Stadelmann & Co., Ltd. (" Tudor " and " Gem "). 4 and 10. Alan Wright (" Inventum "). 5 and 12. General Electric Co., Ltd. 6. Chas. Joyner & Co. (" Flicker "). 7. Veritys, Ltd. (" Efficient"). 9 and 15. Carron Company (" Capella " and " Georgian "). 11. Siemens Electric Lamps and Supplies, Ltd. (" Chiltern "). 13. Berry's Electric, Ltd. (" Wonderberry ").

New Fires for the 1931-32 Season

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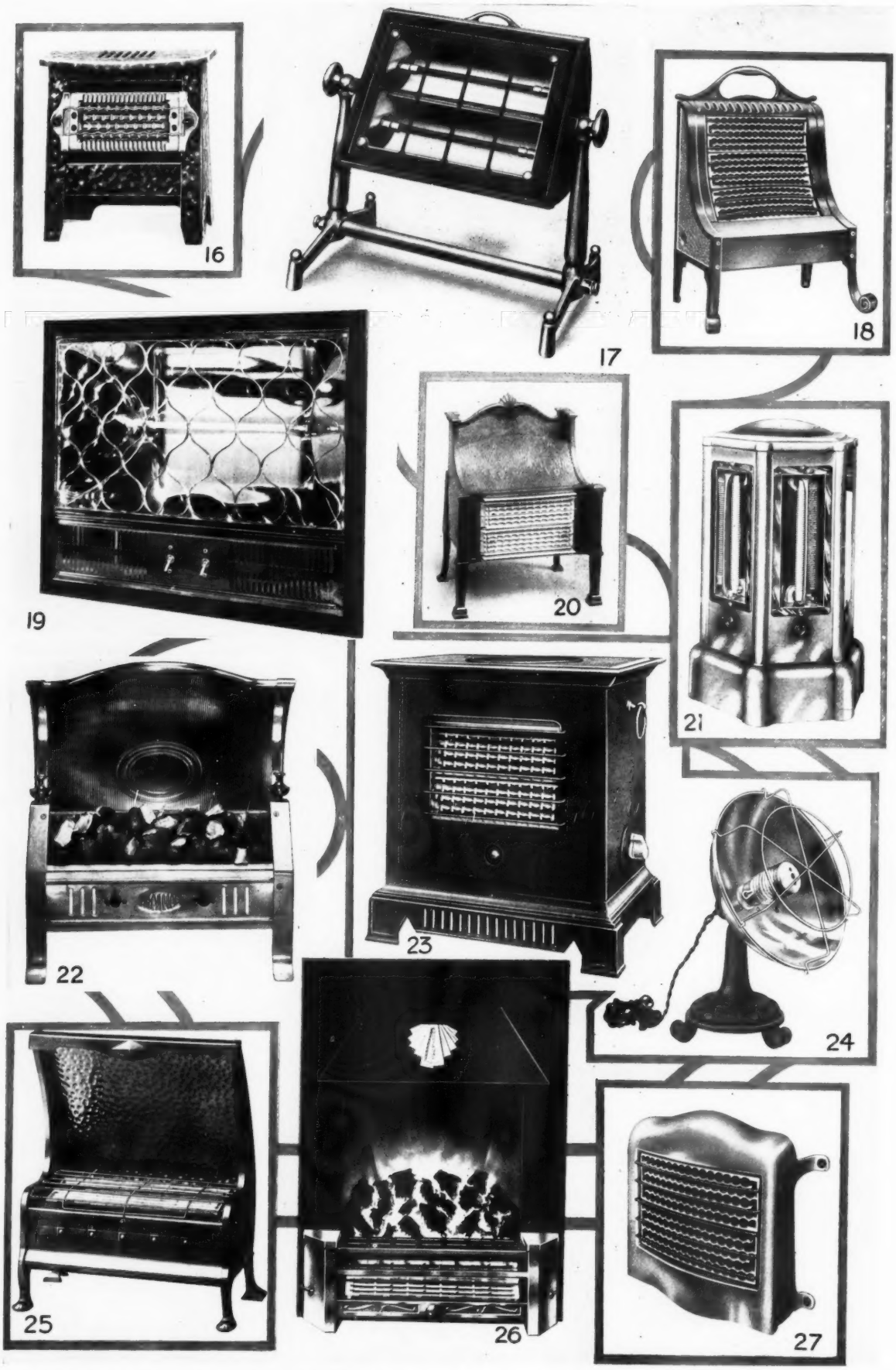
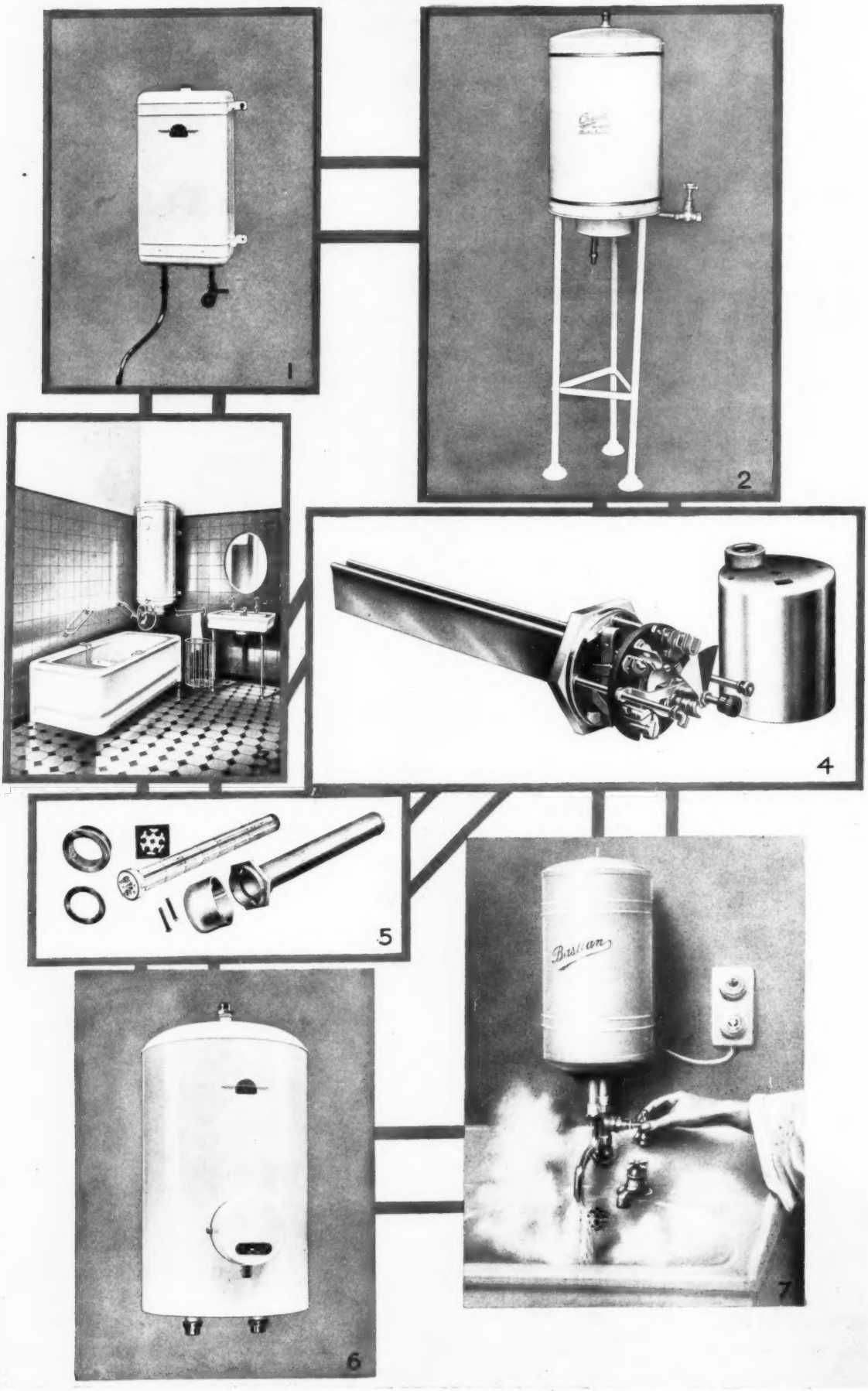


16 and 24. Lighting Trades, Ltd. (" Redot " and bowl type). 17. Carborundum Co., Ltd. (" Solaray "). 18 and 27. Arora Co. (" Robust " and " Bathroom "). 19. Ferranti, Ltd. (flush type). 20. Best & Lloyd, Ltd. (dog-grate pattern). 21. Credenda Conduits Co., Ltd. (" Equator "). 22. Electric Fires, Ltd. (" Night Moth "). 23. General Electric Co., Ltd. 25. Siemens Electric Lamps and Supplies, Ltd. (" Victor "). 26. Berry's Electric, Ltd. (" Insette ").

A Selection of New Electric Fires—

28. Best & Lloyd, Ltd. (" Rippleray "). 29. Edison Swan Electric Co., Ltd. 30. Revo Electric Co., Ltd. (" Regent "). 31, Sun Electrical Co., Ltd. (" Primo " diffuser). 32. Jackson Electric Stove Co., Ltd. (" No. 754 "). 33. H. W. Sullivan, Ltd. (" Invicta "). 34. Electric Fires, Ltd. (" Canopic "). 35. Girlings, Ltd. (" Mosaic "). 36. Lighting Trades, Ltd. 37. Chas. Joyner & Co., Ltd. (" Boudoir "). 38. British Electric Transformer Co., Ltd. (" Tricity "). 39. Ferranti, Ltd. (wall model). 40. Premier Electric Heaters, Ltd. (" Reflex ").

— for the 1931-32 Season

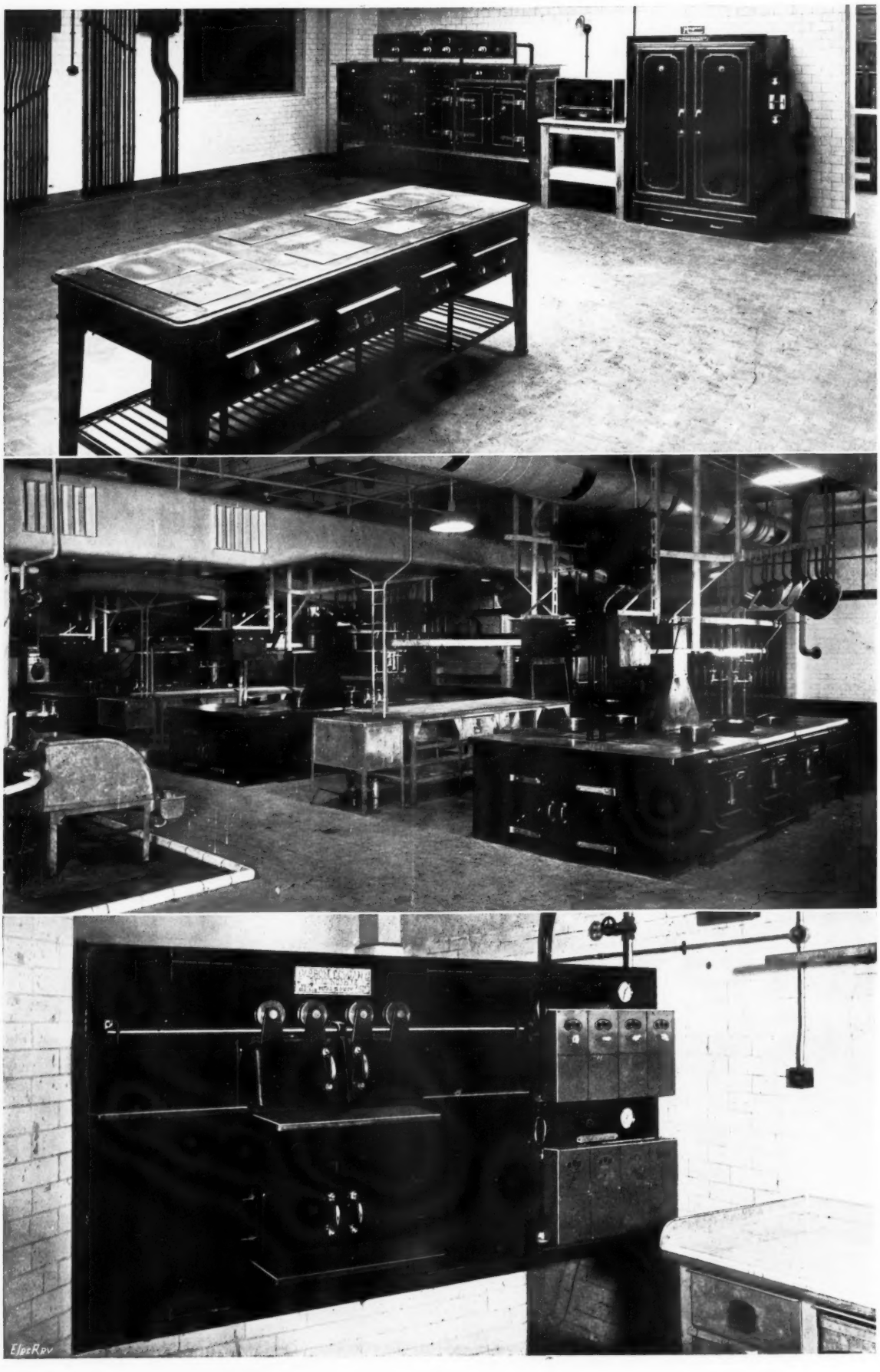


1. " Heatrae Flat 3." 2. A new " Creda " heater. 3. A " Cumulus " equipped bathroom. 4. " Gee-Gee " accident-proof immerser. 5. Components of " Revo " immersion heater. 6. " Heatrae Aux." 7. Service from a " Bastian."

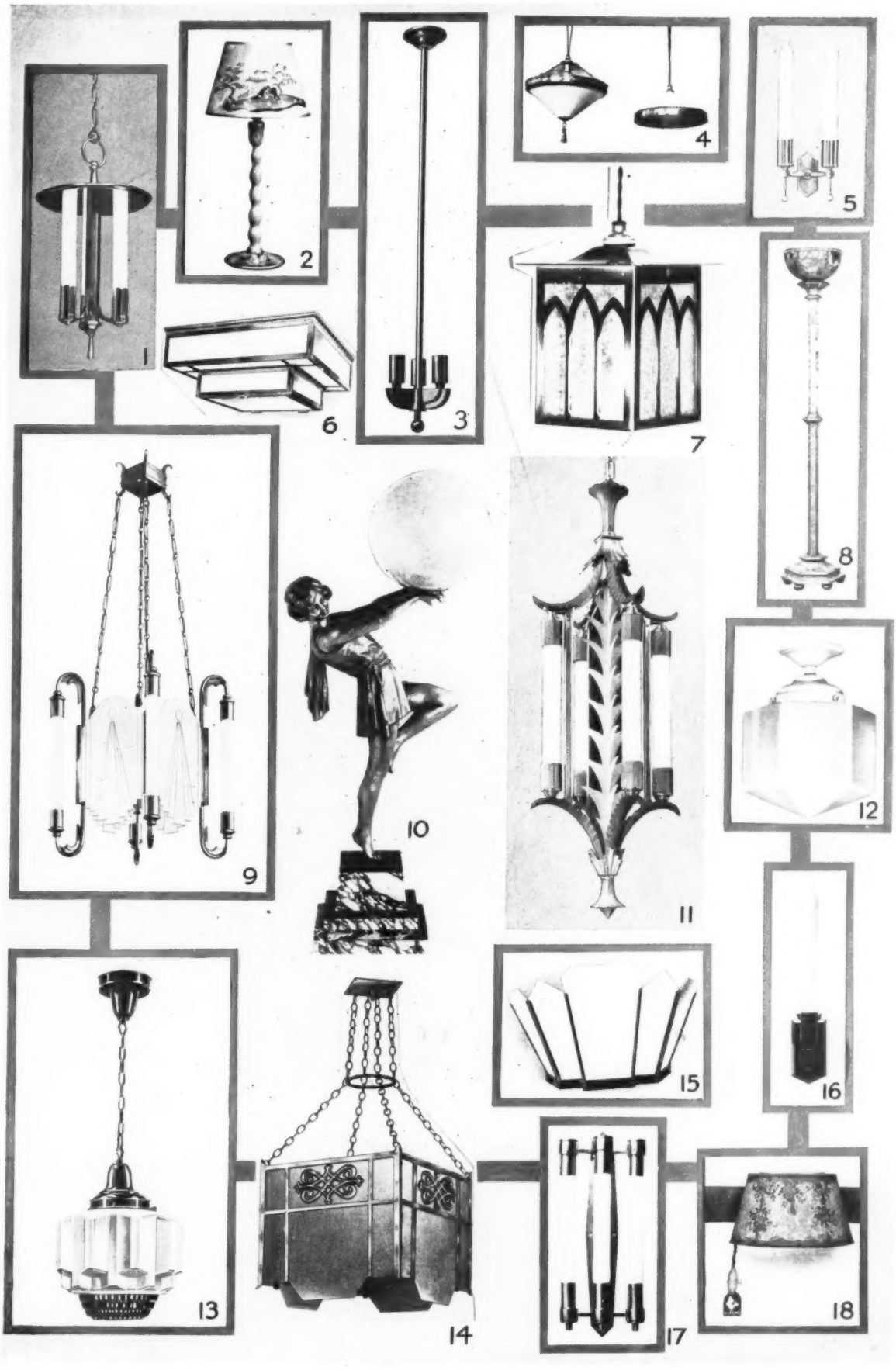
Water-heating Equipment referred to in this Issue

1. Baker Perkins two-deck peel oven. 2. "Tricity 800," with experimental thermometer. 3. A new "Magnet." 4. "Revo" with "Superspeed" boiling plate. 5. Table model "Carronette." 6. Improved "Xcel" range. 7. An Archibald Kenrick cooker. 8. One of the new "Creda" models.

Some examples of Cooking Apparatus now available

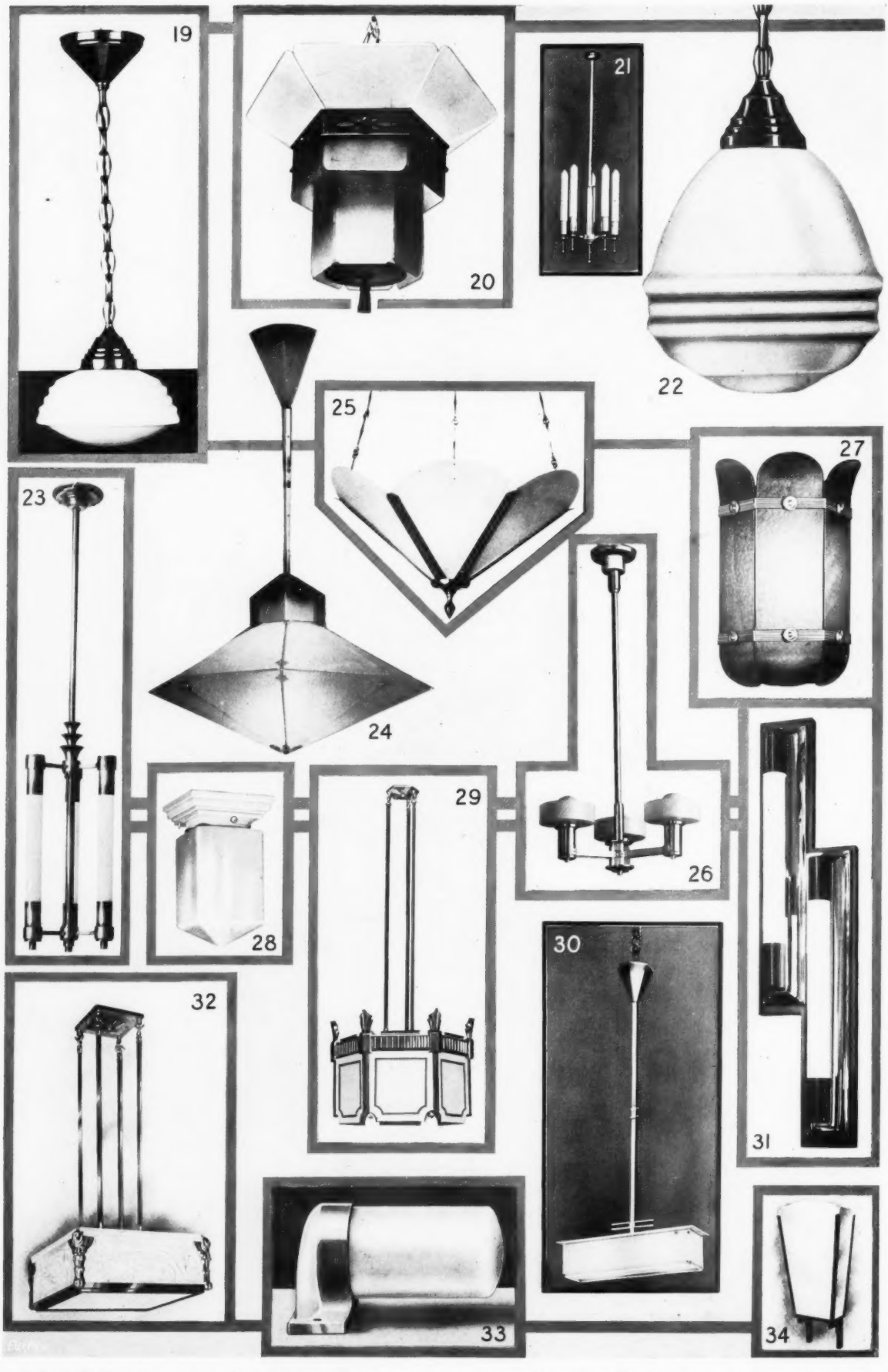


Examples of Heavy-duty Kitchen Equipment referred to on page 597



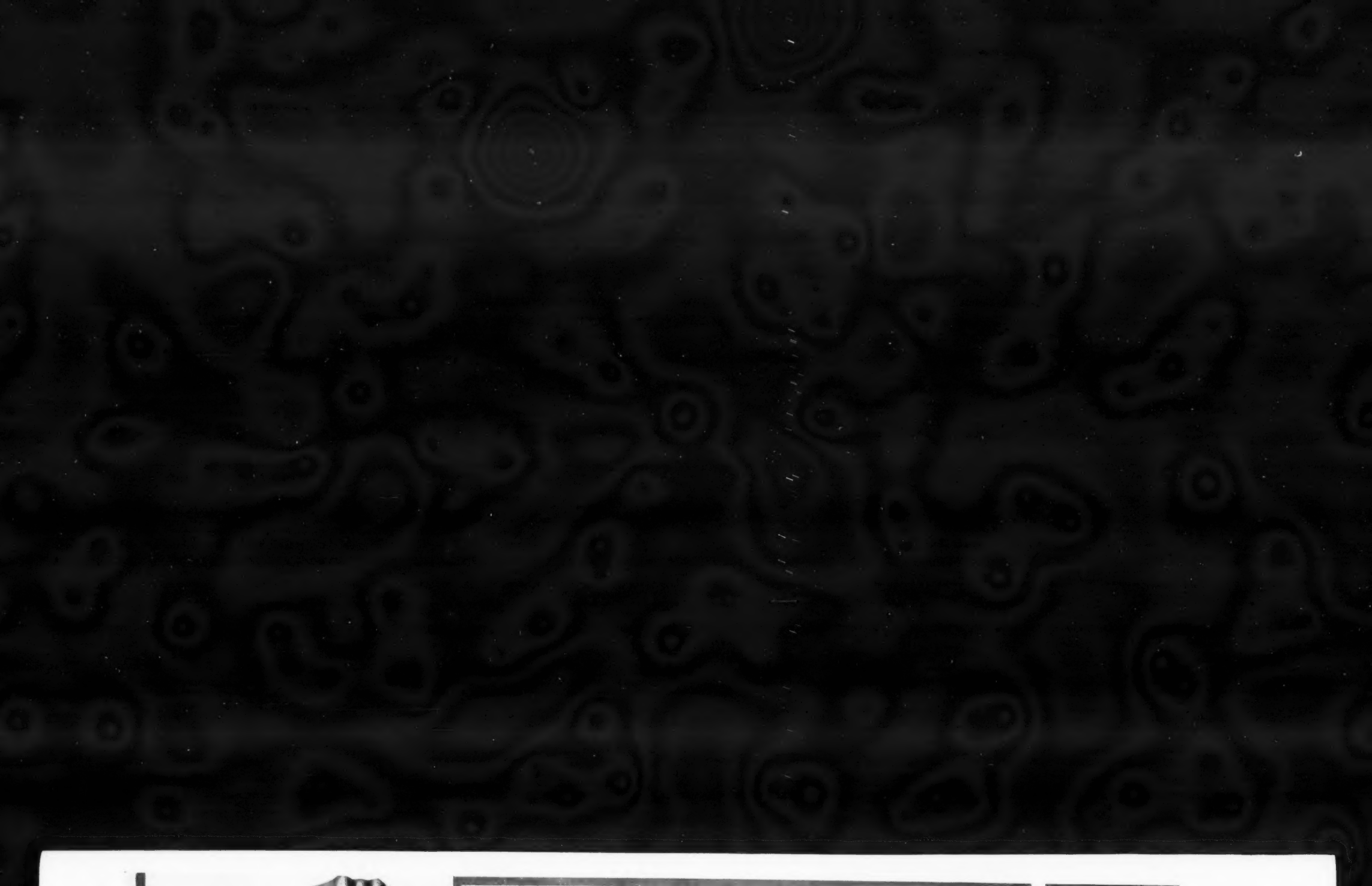
1. Best & Lloyd. 2 & 8. F. Parks, Ltd. 3, 16 & 17. Siemens Electric Lamps & Supplies, Ltd. 4. F. Turner (Art Metal), Ltd. 5. Falk, Stadelmann & Co., Ltd. 6 & 15. Hailwood & Ackroyd, Ltd. 7. Rd. Johnson, Clapham & Morris, Ltd. 9. W. McGeoch & Co., Ltd. 10. Lighting Trades, Ltd. 11. Troughton & Young, Ltd. 12 & 13. L. G. Hawkins & Co., Ltd. 14. Drake & Gorham Wholesale, Ltd. 18. Louis Dernier & Hamlyn, Ltd.

Some New Lighting Fittings



19 & 22. Philips Lamps, Ltd. 20 & 21. Falk, Stadelmann & Co., Ltd. 23 & 31. Troughton & Young, Ltd. 24 & 30. Louis Dernier & Hamlyn, Ltd. 25. Rd. Johnson, Clapham & Morris, Ltd. 26 & 29. Sun Electrical Co., Ltd. 27. Drake & Gorham Wholesale, Ltd. 28. L. C. Hawkins & Co., Ltd. 32 & 34. Hailwood & Ackroyd, Ltd. 33. Korting & Mathiesen Electrical.

Some New Lighting Fittings



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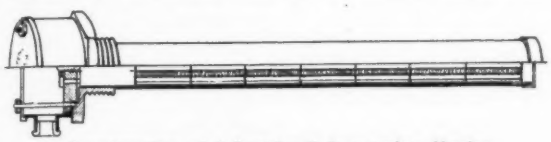
Water-heating Equipment

The lack of economical supply tariffs, generally, is still a serious drawback to development

LOOKING up the corresponding articles in our special autumn issues for the past three years, we find that in each case the introduction is in effect the sub-title of this article. It is difficult to strike a new note, for the tariff problem is still by very far the dominating factor, and until there is a much more general reduction than has been the case during the last few years, the development of the water-



Construction of "Angelus" Immersion Heater

heating load, and hence water-heating equipment, is bound to be slow.

However, the past year has certainly seen some improvement in the tariff question, but chiefly in isolated cases in which the undertakings have tackled the problem in real earnest with very promising results. That the manufacturers have been, and are, ready to meet the situation as improvement occurs is evidenced in the following references to the equipment now available, some of which is illustrated on p. 588.

Of several new features in design which have been introduced recently in the "Canvary" heaters of Berry's Electric, Ltd., one is the elimination of rubber gaskets; the makers claimed to have produced a perfectly water-tight joint. It will be recalled that these heaters are supplied with a special valve which enables the water to be varied from scalding hot to cold as it flows from the heater without the addition of an external mixing valve.

A new departure by the Revo Electric Co., Ltd., is the production of a range of immersion heaters. The element is unbreakable, and is built up of sectional refractories mounted on a square metal bar which does not scale or allow the element to twist. Each spiral wire lies in its own channel, protected yet not restricted in heat emission. The tube into which the element fits is made of heavy-gauge copper, heavily tinned, and is provided with a cast-brass cover with a push-on fit, and held in position by a key cast integral with the cover and a key-way in both the terminal porcelain and the tubing, all finally screwed together. When once in position neither the cover nor the element can be disturbed in any way. A flange with a copper asbestos washer is provided for fitting into the tank. The heaters can be controlled by independent switches, or alternatively by means of thermostats, the latter method ensuring an automatically regulated temperature of water in the cistern without attention. The immersers are made in seven sizes of 1½ in. diameter, with loadings from 200 to 2,000 watts, and five sizes of 2 in. diameter, with loadings from 1,000 to 3,000 watts.

In connection with their water-heating developments, Ferranti, Ltd., have produced a thermostatic switch which controls the electricity supply so that the water temperature is kept constant, and the consumption of electricity is limited to an amount strictly proportional to the quantity of hot-water used. To raise the temperature, the dial is turned in a counter-clockwise direction, one notch representing about 5 deg. F. The incoming cold water is prevented from mixing with the hot water in store by a suitably designed baffle over the cold inlet aperture.

The Ferranti water heater consists of a water container of stout-gauge plain copper, the seams and joints of which are copper welded. The whole is enclosed within a sheet-steel casing of heavy-gauge material finished in either white or grey cellulose. The heating elements and automatic thermostatic switch are contained in copper pockets, from which they may be removed without disturbing the contents of the water container, mounted on a large hand-hole plate introduced into the lower part of the heater. This hand-hole plate may be removed for cleaning purposes should this become necessary.

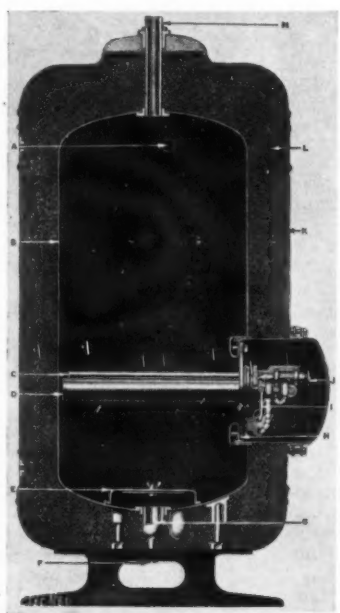
"Genii Vectis" local storage water heaters supplied by George Nobbs, Ltd., for baths, sinks, etc., are constructed with copper water containers and copper outer casings, white enamelled. The immersion heaters may be controlled by three-heat switches or thermostats.

"N.S.C." and "N.S.G." thermal-storage pressure-type heaters are suitable for connection to the ordinary ball-valve feed-water cistern to serve any number of hot-water taps off one storage, and have an adjustable temperature control switch embodied in the terminal box. The internal water container is made of copper for soft-water or of galvanised-steel for hard-water supplies.

The new "Heatrae A.U.X." water heater, by Electric Fires, Ltd., is intended to work in conjunction with a separate coke-fired or range boiler. It takes the place of the usual storage cylinder, unions being provided for the primary flow and return pipe connections. When the boiler is stoked up, the automatic control on the heating element disconnects the current, and when the fire is allowed to die down the electric heater automatically takes over the work.

The "Heatrae Flat 3" is designed especially to provide a compact apparatus for use over or near lavatory basins, where space is limited and appearance is important. The cold-water inlet pipe is arranged in such a manner that it is impossible for water to return back into the main in the event of the pressure failing and the inlet valve being open. The hot water is discharged through a permanently open swan-neck spout fitted with a swivel union. The loading is 750 watts, and the immersion heater is of the removable-core type and, together with the thermostat, is mounted on a removable plate at the bottom.

The "Heatrae N.R.D.," for kitchen use, is circular in form and is made in two sizes, 1½ and 3 gallons, the fixing centres of both of which are the same, so that if a 1½-gal. heater is found insufficient for any particular job a 3-gal. equipment can be fitted instead, with a minimum of trouble. The cold-water inlet pipe has the special non-return arrangement, employed in the "Flat 3" heater. The loadings are 500 W for the 1½-gal. size and 750 W for the 3-gal. model.



Arrangement of Ferranti Horizontal-element Heater

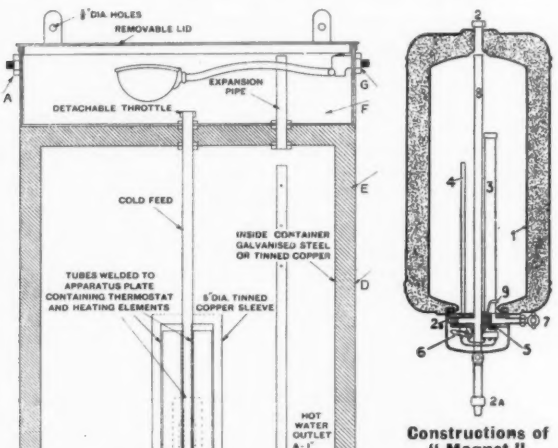
A, hot outlet; B, copper container; C, thermostat pocket; D, element pockets; E, baffle plate; F, drain plug; G, cold inlet; H, flange plate; I, element connections; J, thermostat; K, steel outer case; L, granulated cork lagging; M, top outlet.

A feature of a range of "Angelus" immersion heaters by Charles Joyner & Co. is that the elements are withdrawable without removing the tube or emptying the tank. The range includes ten sizes with loadings from 250 to 2,000 W and tail lengths from 7¼ to 17 in. An adjustable wiring inlet is supplied. In cases where immersion heaters have to be fitted from a position entirely outside the tank, special "Colman" flanges can be supplied. Six-ampère mercury-type thermostats are also available for use with these heaters. It is interesting to learn that the "Angelus" thermal-storage tank and the "Instanter" geyser are maintaining their initial successes.

The Arora Co. has in development at the moment a type of water-heater designed to operate as a circulator. It occupies a very small space and is loaded at 3 kW. It is designed for coupling to an existing domestic hot-water system as an alternative to, or in conjunction with, the existing fire to the hot-water cylinder already installed. Some engineers seem to prefer this method to employing immersion heaters inserted actually into the cylinder, but even with the circulator it is still necessary to have the thermostat controlling the load, inserted in the cylinder, as obviously that is the point of control and not the actual boiler forming the circulator. It is interesting to learn that this company has 150 of these circulators working satisfactorily in one area where the makers' "D" immersion heaters are employed for existing hot-water systems.

The new water heaters by Bastian & Allen, Ltd., are easy to install and can be connected directly to the water mains, being fed through a ½-in. stop-cock and a ⅜-in. high-pressure ball valve. Furring is minimised and the life of the elements lengthened by the very low temperature at which the immersion heaters run. All a.c. heaters are controlled by "Satchwell" thermostats-type H for ratings up to 600 W, and type W for higher ratings. An important point in the "Bastian" storage heaters is the avoidance of mixing cold water with the hot when water is drawn, the inlet being regulated at a rate in proportion to the heating effect. A 1½-gal. heater of the displacement type, is constructed to avoid dripping and has a device which would prevent the heater from being damaged should the water supply fail and the heater become empty.

The thermostat employed by Sadia, Ltd., in conjunction with its heaters is fitted with a special locking and sealing device. The thermostat as well as the element can be removed



Constructions of "Magnet" Cistern and (right) Sadia Equipments

A, overflow (interchangeable with ball valve); B, apparatus plate with thermostat and heating elements attached; C, withdrawable heating elements; D, white-enamelled steel casing; E, granulated cork lagging; F, cold-water tank; G, ball valve interchangeable with overflow).

without having to empty the water from the container. The Sadia water heater, illustrated on this page, works on the displacement principle, *i.e.*, cold water entering the tank forces the hot water out. By this means the inner tank is always full, and there is no danger of damaging the heating element. All parts are so arranged as to be easily accessible. The water container 1 is surrounded by a very thick layer of good insulating material which is enclosed in an outer cylinder. The heating element 3 stands upright, and is totally immersed in the water, the same applying to the thermostat 4. The cold water enters at the bottom 7, fills the tank and overflows through pipe 8 either at 2A, 2B and on top at 2. A baffle dome 9 prevents undue mixing of hot and cold water. A draining plug 5 is also provided.

In connection with their comprehensive range of domestic water heaters Nathan & Allen, Ltd., have recently introduced a new rust-proof tank which will stand a water pressure of 170 lb. per sq. in. This affords an effective substitute for the copper cylinder where very soft water has to be dealt with. Another new feature in connection with "Cumulus" heaters is that the thermostat and element can be inserted together through one large hole in the tank. The element is made of special wire wound on a supporting tube, which in turn is inserted in a copper tube flanged at one end and closed at the other. This tube is in direct contact with the water. The temperature regulator switches current off the heater when the water reaches any desired temperature; it is usually set for about 194 deg. F. When the water temperature falls to about 180 deg. F. it switches current on again, and it remains on until the water reaches a temperature of 194 deg. F. It is contained in a protecting tube and may be withdrawn without emptying the boiler.

Among a comprehensive range of "Gee-Gee" immersion heaters produced by George Green & Co. is the "accident-proof" immersion heater which has a rotary switch action in the cap. It automatically switches off the current if it is allowed to run dry. The switch merely has to be put on again by hand after it has operated, and there are no fusible or replaceable parts at all.

"Condensacone," the new Inventum water heater marketed by Alan Wright, is claimed to offer a solution to hard-water troubles. The element and thermostat are contained in a separate heating chamber which, after being filled with water when the heater is first installed, is replenished with pure water evaporated and distilled within the heater. No deposits other than those from the initial filling can accumulate on the element sheaths. The surface of the heating chamber is very large and, due to the thermostatic control of the distilled water within it, can never attain a higher temperature than that predetermined.

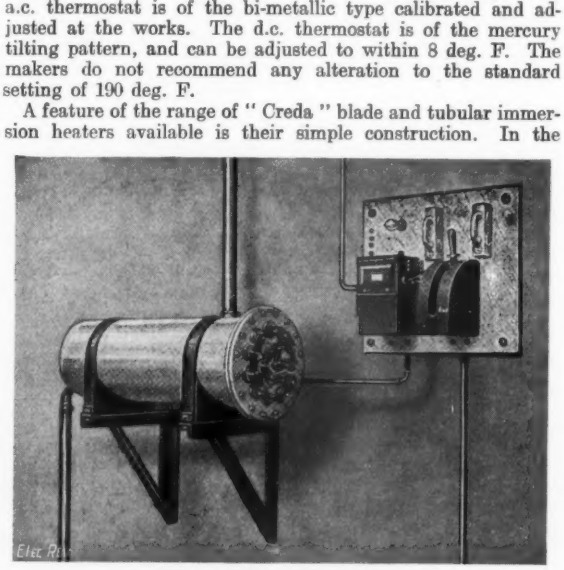
The latest range of "Magnet" electric storage water heaters by the General Electric Co., Ltd., employs a rectangular cistern, and while it is supplementary to the main range of cylindrical water heaters, it embodies the dependable features of that range. Further, the rectangular water heater is particularly suitable for small bathrooms where often it is impossible to install a cylindrical water heater of the desired capacity.

The cistern-type water heater is essentially a self-contained hot-water system, as the cold-feed tank with the ball valve and the hot-water supply tank with the necessary heating elements and thermostat are embodied in one unit. An external expansion pipe is therefore not necessary with this type of water heater, the only connections required being those for the cold-water supply to the water heater and the hot-water supply from the water heater to the bath, wash-basin, &c. Plumbing costs are thus reduced to a minimum, a notable advantage in the case of installations in large blocks of flats. These cistern water heaters are made with tinned-copper interiors, while the exterior casing is of sheet steel finished in white enamel.

In all the three ranges of "Magnet" water heaters the following are important features: special withdrawable-type immersion heater; patent bi-metal quick-make and-break thermostat; efficient lagging to ensure minimum loss of heat; and side hand-hole for convenience of cleaning interior.

The following notes are taken from the general specification for the Creda automatic water heaters of both the push-through and ball-valve types introduced by the Credenda Conduits Co., Ltd. The outer body is of lead-coated steel, rustless and finished externally in white enamel, lined scarlet and gold. The inner body is of welded or brazed tinned copper, and the space between the inner and outer bodies is filled with shredded-cork insulation. An anti-mixing device prevents the incoming cold water combining with the hot water in the cylinder. The heating element and thermostat can be withdrawn for inspection without breaking any water joints, and the cylinder can be cleaned out. Brackets are provided for wall mounting, and a stand can also be supplied for the 5-, 11- and 17-gal. models. The 30- to 50-gal. sizes are not arranged for wall fixing, but for floor mounting only. The a.c. thermostat is of the bi-metallic type calibrated and adjusted at the works. The d.c. thermostat is of the mercury tilting pattern, and can be adjusted to within 8 deg. F. The makers do not recommend any alteration to the standard setting of 190 deg. F.

A feature of the range of "Creda" blade and tubular immersion heaters available is their simple construction. In the



A 30-kW Circulating Boiler

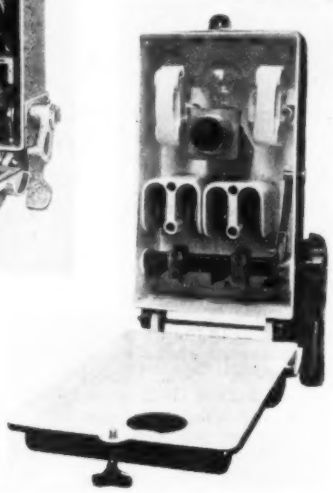
tubular type a hard-drawn copper shell is brazed into a cast end piece into which the element is fitted, and the "former" is of a special fireclay upon which the spiral is threaded.

It has not been possible to deal with heavy-duty equipment in this article, but there is much apparatus of the kind which has a bearing on the domestic problem. To take one example at random, the first illustration on this page is of a circulating boiler, the object of which is two-fold: it is particularly suitable for cases where it is undesirable to put heating elements in the main boiler, and for replacing an existing coke-fired boiler. The unit is self-contained, simple to erect and automatic.

Cooking-apparatus Development

Progress in the production of Domestic and Industrial Apparatus

At first sight it may seem strange that among all the manufacturers who have co-operated with us in the preparation of this article not one has made reference to the "British" cooker which, as the British standard cooker, first appeared at the I.M.E.A. Convention at Eastbourne last year. It was welcomed as a sign that manufacturers were ready to agree on a common design. The preliminary sample was subjected to much criticism, with the result that a revised model appeared at the I.M.E.A. Exhibition again this year at Scarborough; since then we have heard little. The silence is not uncomplimentary to the "British" cooker, but should be considered in the light of the fact that there is a decided trend to bring individual makes of apparatus nearer in line with the standard set as far as essential features are concerned—dimensions, loadings, etc. Apart from the general rally referred to, the principal developments during the past year have been in the introduction of refinements, still more attractive finishes, and towards simplification generally.



Cooker Control Units.
Above: G.E.C.

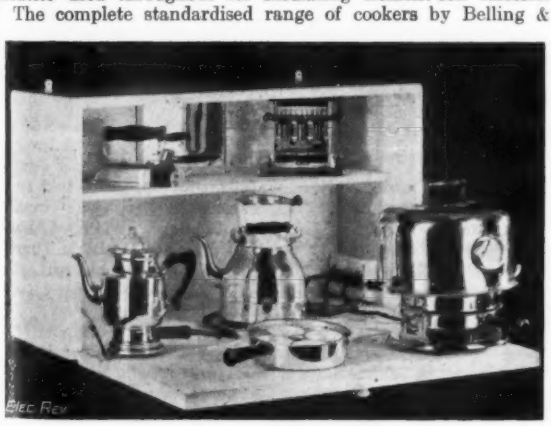
Right: Reyrolle

Domestic Cookers

Domestic Electrification, Ltd., have recently introduced two new models of cookers, Nos. 4 and 6, for two to five and four to six persons, respectively, the design closely following the general specification to which all the "Dolphin" cookers are made. Some of the more interesting points about the apparatus are: all plug-in elements, with earth-pins; wide-radius rounded corners in the ovens; all the wiring is outside the lagging and hot-cupboard; and a permanent venilator is provided at the back of the oven. The makers have found that this ventilation makes practically no difference at all to the heating-up time of the oven, but that it does prevent condensation of steam in the oven.

We have already dealt with the No. 800 "Tricity Combination" cooker of the British Electric Transformer Co., Ltd., in our review of the I.M.E.A. exhibits at Scarborough this year, but we take this opportunity to illustrate the wiring connections and the new terminals adopted, and also an advance model fitted with an experimental thermometer. Briefly, the new features embodied in this model are: new large-type 2-kW enclosed boiling plate; new quick-release terminals for plates and grill; elements directly connected, dispensing with terminal bar; protected arrangement of connections under hob; white vitreous enamelled withdrawable draining plate under hob; lever support for hob when in open position; grill drop door fitted with frictional balance spring; oven shelf runners enamelled; lever-type oven-door handle; new one-nut fixing switches; larger hot-cupboard space; and steatite used throughout for insulating element-coil carriers.

The complete standardised range of cookers by Belling & Co. consists of four sizes only in one finish—all-enamelled. There is much, we think, to be said for simplification along these practical lines; the limitations are a help to the supply undertaking and to the consumer. Belling's do not appear now to size their cookers according to certain numbers of persons. The smallest model of the range has a total loading of 2,750 W and is equipped with an 8-in. square boiler-griller, 1,750 W. The boiler-griller element also serves as top heat for the oven. The second model has a similar boiler-griller, but entirely separate from the oven, and in addition there is a 6¼-in. diameter, 1,000-W boiling plate. The oven is equipped with 850-W top and bottom elements. With the same number and style of components the total loading of the third Belling is brought up to 5,150 W. The largest cooker has a second boiling plate, and the total loading is 6,550 W. The three larger models are also available in the horizontal style, the only difference being that the oven and the boiling plates are mounted side by side on a stand with a useful shelf below. An outstanding feature of these cookers is the new "cellular" boiler-griller, which is made of a special alloy. The top of the plate is perforated, so that the "heat" is visible, and it is claimed that the perforations increase the boiling efficiency without in the slightest degree impairing the reliability.



"Universal" Cooking Cabinet

The standard finish of "Xcel" cookers sold by Siemens Electric Lamps & Supplies, Ltd., now includes vitreous-enamelling for the heavy sheet-steel outer casing and the actual oven inner body. A point about this which makes a strong appeal to the supply engineer is that it materially increases the life of the cooker by preventing corrosion. An improved design of oven inner body enables the makers to lag the cooker right up to the door opening, thus increasing the efficiency. The grill can now be arranged with interlaced windings, so that in any position of the switch the heat is evenly distributed over the entire grilling area. "One-hole fixing" switches facilitate wiring and avoid screw heads on the white vitreous-enamelled switch plate.

Archibald Kenrick & Sons, Ltd., draw attention to the following points in connection with their cookers: the heat elements in the oven are placed at the bottom, but should a customer prefer side and bottom heat they can arrange the elements to suit without extra charge; and the boiling rings and also the oven elements are all "Chromolox" units.

The No. 8 cooker of the Revo Electric Co., Ltd., has proved so successful since its introduction at the British Industries Fair this year that smaller and larger models embodying the same principles have now been designed. They are to be known as the Revo No. 6, No. 8, and No. 12. Each is identical in design, the only difference being in the oven and hot-cupboard loadings and sizes, and in the cases of Nos. 8 and 12 each has two enclosed boiling plates. Plug-in elements are fitted throughout and are trouble-free. Six other patent devices are included in the make-up of these cookers, amongst them being a new grill-boiler, a removable drip-tray below the boiling plates, and an all-steel vitreous-enamelled grill pan. The simplified system of wiring is also a feature, and the boiling plates are secured in position by a self-locking device. Among other special features are the double ventilators on the oven door to prevent steaming.

An outstanding feature of the new range of cookers of the Jackson Electric Stove Co., Ltd., is the simple manner in which the boiling plates and their supports can be removed from the cooker top without the use of tools. This arrangement is of a revolutionary character, and it is claimed that the Jackson cooker is the only one in which the whole of these parts can be removed in such a simple manner. Quite apart from the convenience of this arrangement to the consumer, a considerable saving is effected by the supply authorities handling the various models.

A feature of the DC.5768L cooker recently introduced by the General Electric Co., Ltd., is that it is being listed in "de luxe" finish only, and the General Electric Co., Ltd., is to be commended on standardising the new grey porcelain-enamel finish, as it will do much to attract the housewife to the cleanliness connected with electric cooking. A splash-guard and an oven heat indicator are included in the outfit. Ample hob space is available, and a large warming cupboard with a door is provided. Another model of the range is the DC.5759, suitable for families of up to six persons, and among its special features is the revised wiring system, in which the switches are arranged with remote control. Experience has shown that the adoption of this system of mounting has the advantage of cutting down to a minimum the wiring and connections. Other interesting models of the range are the DC.5744 and DC.5740. Each of these are available with an alternative hob equipment, the DC.5744 having two hotplates, 8 in. and 7 in. diameters, respectively, whilst a third hotplate of 6¼ in. diameter is fitted to the DC.5740. A large number of extra fittings has always been a source of some annoyance to purchasers of electrical cookers, both in the trade and among the general public. The only optional extras which are now offered with "Magnet" cookers are a small towel rail at the side, or a high splashguard with a shelf which can be obtained as an alternative to the low splashguard normally included.

"Efesca" Hotplate

We are pleased to hear that the introduction of the range of "Efesca" cookers by Falk, Stadelmann & Co., Ltd., a few months back has met with success. In addition to the "Minor," "Media," and "Major" models with which we have already dealt, there is a table model, the "Eye-level," which consists of an oven and a cooking top placed side by side on a stand. The space behind the cooking top up to the top of the oven is filled in with an enamelled wall plate. A porcelain-enamelled shelf is fitted between the legs of the stand. The constructional features, apart from the table design, follow the general specification for the range. The 7-in. by 9-in. boiler-griller is loaded at 1,500 W, and the solid boiling plate at 1,600 W. The overall dimensions are 46 in. high by 40 in. wide by 17 in. deep, and the total loading is 4,460 W.

Following the general construction of the "Carronette" vertical cooker, which we have already described, Carron Company has also introduced a table model the overall dimensions of which are 34 in. high to the hob, 41 in. wide, and 12 in. deep. The loadings, cooking space, etc., follow the general specification which we have already outlined.

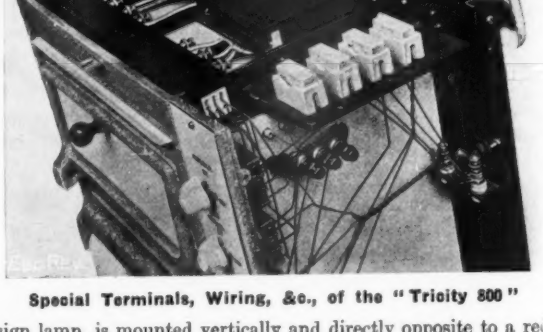
It was interesting to see in some new cookers just marketed by Credenda Conduits Co., Ltd., a reversion to the fixed-oven-element principle. Three new models, C.294-5-6, are equivalent in capacity to the popular models Nos. 4, 5, and 6, although on the largest model, at any rate, there is an increased oven loading—2,400 W to 3,000 W—and slightly reduced oven dimensions, 15 in. high by 14 in. wide by 14½ in. deep, as compared with 15½ in. high, 15½ in. wide, and 14½ in. deep for the No. 6 model. The new models are apparently not intended to supersede the older ones, but rather to offer alternative designs. For one thing, there is a decided preference by some supply men and consumers for fixed-oven elements. The elements are contained behind the walls of a removable oven lining, at the sides and bottom. The boiling plates are of the plug-in type, and a point of interest is that the hob plate is hinged at the side, so as to overcome difficulties when the cooker is installed in awkward positions. This feature also provides better access to the fuses. Substantial earthing is another point of note. Two of these models were seen fitted with the "Credastat" oven-heat regulator (illustrated on p. 597), which automatically maintains the temperature of the oven space at any given setting from 200 to 500 deg. F. It replaces the usual three-heat switch. A bi-metal spiral is inserted in the side of the oven. Inside the control-unit casing is a mercury switch which is operated by the movement of the spiral, and the angle of tilt of this switch is varied by a rotary movement of the usual pointer handle and through bevel gears.

Cooker Control Apparatus

Under this heading we refer to the separate "main-switch" type of equipment which is available now in all manner of forms—with and without subsidiary switches, fuses, and so on, for the control of kettles, etc.—as distinct from the actual regulating switches forming integral parts of the cooker proper. For a number of years the production of this type of equipment has been left practically to one company, and it is almost impossible to refer to the comprehensive range of units supplied by J. H. Tucker & Co., Ltd., without repetition. Speaking from memory, there are something like sixty Tucker control units on the market. Among the newcomers in this field are Belling & Co. and M.K., Ltd., to whose products we have already referred. A control unit recently introduced by A. Reyrolle & Co., Ltd., is suitable for all pressures up to 250 V, and it consists essentially of a d.p., double-break, 30-A switch of the quick-make and-break type, with self-aligning protective fuses, and it is provided with an auxiliary circuit coupled to the socket of a 5-A or 15-A British standard plug and socket of the protected type. The switch is fitted with self-aligning contact-blocks which are adequately shielded and protected by means of porcelain arcing shields. The switch and the fuses are enclosed in a cast-iron casing finished in grey enamel, and a small lamp mounted behind a red glass fitted in the cover indicates when the switch is closed and the supply is available for the apparatus. The operating handle, external to the case, is interlocked with the cover.

A change-over unit has been especially designed by this company to enable a supply to be given either to a water-heater or to an electric cooker, or other appliance, as desired, but not to both at the same time. The purpose of this is to maintain a continuous steady demand for the supply mains by ensuring that current is taken by only one of the equipments at any time, and that no overlap can occur. The water-heater provides a steady load at times when other apparatus is not in use, thus rendering special tariffs possible. The unit can be supplied with a neutral or off position, if required, and it is similar in construction to the cooker control unit.

The following notes are taken from the specification covering the "D.B. Magnet" cooker control switch recently introduced by the General Electric Co., Ltd. The case is of cast iron and is available in two finishes—standard (plain-grey stove enamelled) and "de luxe" (mottled-grey vitreous enamelled). The d.p. main switch is of 30-A capacity and has an external interlocking handle. For the pilot light a standard b.c. holder, to take a 15-W "Osram" pigmy sign lamp, is mounted vertically and directly opposite to a red bull's-eye inset in the lid of the case. The kettle sub-circuit is controlled by an S255 5-8-A s.p. "Landor" switch, with a 3-pin brown "Bakelite" hand-shield plug and socket. There are two small H.O. fuses (non-interchangeable), one protecting the pilot lamp and the other the kettle sub-circuit.



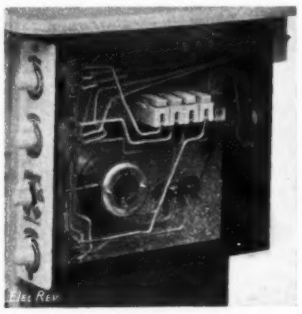
Special Terminals, Wiring, &c., of the "Tricity 800"

Table Appliances

The "Efesca" hotplate, a unit of the comprehensive range of cooking equipment recently introduced by Falk, Stadelmann & Co., Ltd., embodies one totally enclosed boiling plate with a loading of 1,600 W, and one dual-purpose element for grilling and boiling, 1,500 W. Both plates are separately controlled

by a three-heat switch. The hotplate is supplied complete with a white-enamelled drip tin, nickel-plated deflector plate, grill tin and grid, and is available in two finishes—black with porcelain-enamelled hob, and porcelain-enamelled mottled-grey throughout.

A special design of ring element has just been put on the market by Geo. Bray & Co., Ltd., as a boiling-plate component. The boiling plates are manufactured both in the form of portable plates and as range plates for use in electric cookers. They consist of two totally enclosed ring units on a cast-iron support, are arranged for three- or even four-heat switching, and are made in four sizes: 8½-in. dia., 1,750 W; 8-in. dia., 1,550 W; 7⅛-in. dia., 1,150 W; and 6⅜-in. dia., 950 W. The sheathing is of 20 per cent. chromium-steel, and the terminals are all of chromium-steel; 80/20 nickel-chrome resistor is used as the heating element, and it is embedded in a refractory cement.



Position of "Credastat" in Switch Chamber

The table model extra-rapid boiling plate introduced by the Edison Swan Electric Co., Ltd., is designed to serve all general utility purposes where quick boiling, together with high efficiency, is desirable. The whole design, while pleasing in effect, embodies sound electrical methods. The stand is of robust construction and is finished with dull velvety black enamel, with a nickel-finished top-plate. The model can be supplied fitted with either the 6¼-in. or 8¼-in. dia. "Ediswan" extra-rapid boiling plate manufactured under an entirely new process. It is arranged for three-heat control by a rotary indicating snap switch. The main terminals are conveniently situated beneath the boiling plate. It is made in two sizes both with 14-in. by 14-in. top-plate measurements, but with 6¼-in. and 8¼-in. boiling plates, 1,200 and 2,000-W maximum loadings, respectively.

The "Universal Electric Kitchenette" marketed by L. G. Hawkins & Co., Ltd., is the result of an idea of a woman who had to face a space problem in a modern small house. The cabinet contains efficient electrical appliances which will carry out, it is claimed, all the cooking operations for a household of two to four persons. In addition, one of the company's irons is supplied. The cabinet measures 32 in. by 20 in. by 13 in. Three appliances can be fed at any one time from one plug point by using the special multiple plug supplied. The cabinets can be made to suit any decoration scheme, or for recessing into walls, with a mirror front door.

Heavy Apparatus

The No. 6.D. cooker of the Jackson Electric Stove Co., Ltd., consists of two No. 6 ovens, each with a cooking space of 18 in. wide by 24 in. deep by 21 in. high, and loaded at 4 kW. The cooker is mounted on short legs and is suitable for restaurant use for twenty-five to thirty persons. The two ovens are surmounted by a continuous cast hob, mottle enamelled and fitted with Sadia solid-type boiling plates—four of 1.5-kW and two of 2.2-kW capacities, in addition to a grill loaded at 3.75 kW. The total loading is 22.15 kW. The interiors of the ovens are fully enamelled (mottled), and the exterior finish is stove black with white door panels. This cooker can also be fitted with hot-cupboard attachments, the warming space being 24½ in. wide by 12½ in. deep by 9 in. high, and loaded at 400 W, controlled by a s.p. switch and fuse attached. The overall dimensions with switches attached are 62 in. by 33½ in. by 39½ in. without hot-cupboard.

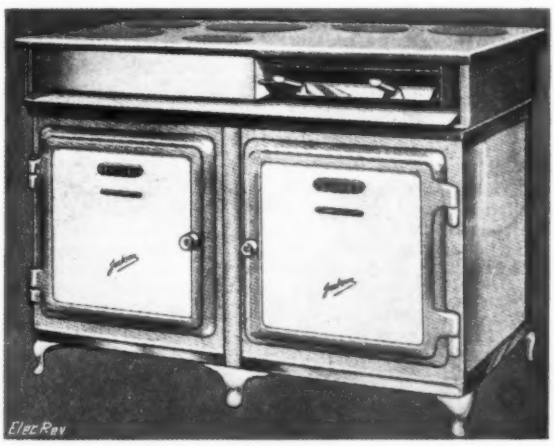
An interesting point about the large cooking equipments made by the Arora Co. is the safety tubular heating in the oven and hot-cupboard. The manufacturers consider that, in order to secure economy in operation, each equipment should be designed to meet actual requirements, instead of offering large standards which may not always fit in to the actual cooking requirements and to the actual space available in the kitchen.

The well-established merits of "Magnet" industrial cooking and baking equipments need no emphasising, and several large installations in all parts of the kingdom are a testimony to the soundness of the company's claims. In the installation in the kitchen of the Weavers' Institution Convalescent Home, Poulton, the equipment comprises a large boiling table fitted with high-temperature, quick-boiling plates, a roasting cabinet, triple-oven roasting range, and a griller toaster. Large kitchen equipments on similar lines have been recently installed at the Zoological Society's restaurants, Messrs. Peacock's restaurant, Glasgow, and the large canteen kitchen of the Grampian hydro-electric power works in Inverness-shire, where 550 workpeople are catered for daily.

In their propaganda Baker Perkins, Ltd., stress the fact that the modern baker requires an oven upon which he can rely as a baking instrument of absolute precision; a mere chamber to which heat is applied is not good enough. In the two-deck Peel oven recently shown by this concern at the Bakers' and Confectioners' Exhibition at the Agricultural Hall, Islington, the chambers are under separate control. Two classes of goods can be baked at the same time at different temperatures, and, if desired, only one chamber need be employed, with corresponding economy.

Both Carron Company and Benham & Sons, Ltd., say that the trend of development with regard to heavy cooking equipment is towards electric baking combined with gas or steam boiling. While the latter company asserts that it is not practicable to produce sufficiently intense heat in hot plates to suit clubs, the former concern suggests that the reasons for the lack of popularity of the electric hotplate in heavy-duty equipment are partly due to commercial considerations and partly to prejudice among chefs, etc. Illustrations on p. 590 depict an interesting installation by Carron Company at the Dorchester Hotel kitchen. There are three large central ranges in the main kitchen and one in the staff kitchen, and the ovens are electrically heated with a novel method of control indication. The pastry oven and the bread and Vienna-roll baking ovens are also electrically heated. The large oven in the bakery has two chambers, the upper one being specially constructed for Vienna bread and rolls, and the lower one for ordinary tin loaves or sandwich bread.

We are interested to learn that Richard Crittall & Co., Ltd., have recently purchased the business of the Briffault Range Company, and among the results of this development will be the production of an entirely new line of electric cooking apparatus, suitable for the equipment of kitchens of the highest grade, and embodying the results of the long experience which both the companies in question have had in the design and installation of general cooking and service



Jackson Heavy-duty Cooker

equipment. The two organisations have between them been responsible for the kitchen equipment of a very large number of the most important hotels in Great Britain and France, and while the application of electricity to apparatus of this type has not made such progress in France, the confidence which has been inspired amongst such societies as the Société Culinaire by the names of Crittall and Briffault will, it is hoped, ensure as much interest in these developments among chefs and hotel managers as amongst electrical engineers.

It will be recalled that the electrical cooking equipment in the kitchens of Imperial Chemical House, Millbank, London, which are designed to deal with 2,000 luncheons daily, was specially designed by Crittall's, representing a connected load of 250 kW. It includes two roasting ovens with internal dimensions of 24 in. wide, 28 in. deep, and 52 in. high, each compartment being loaded at 15 kW. The pastry oven also has two compartments, each measuring inside 38 in. by 32 in. by 11½ in. high, and being loaded at 6 kW. A fish-frying suite has three welded-steel pans under each of which are elements loaded at 7.5 kW. A double-compartment electric grill is loaded at 10 kW per compartment. There is also a set of electrically heated hot closets for the main service, of which two bain maries form part. The heating elements in each of the end hot closets at the bottom are loaded at 6 kW, those in the centre closet at 5 kW, and under each of the bain maries there are elements loaded at 4 kW.

Communication Over Power Lines. By F. B. Willis

The relative merits of interphase *versus* single-phase and earth coupling

ALTHOUGH I agree generally that communication between power stations on an interconnected system by means of high-frequency telephony over the transmission lines themselves provides the operating concern with a reliable service, there are several statements in recent articles* which are contrary to my experience.

The question of interphase *versus* single-phase and earth coupling of the line to the transmitter and receiver is one which warrants some attention, as interphase systems require more equipment and single-phase and earth systems more power.

A high-frequency communication system superposed on a power line radiates energy which can be received by suitably tuned, or neighbouring, wireless receivers. Such a system is, therefore, considered by the authorities to be "ether communication" and it comes under the regulations governing radio services, particularly with regard to the disturbance which is likely to be created in the neighbourhood of the line.

It has been ascertained by actual trials that a single-phase and earth system radiates twice as much as an interphase system for equal inputs. As the attenuation of the single-phase and earth connection is higher than that of the interphase, more transmitting power is required for the single-phase system; from actual measurements this increase of input was found to be nearly two and a half times.

Thus, the radiation of a single-phase and earth system is considerably more than that of an interphase system owing (i) to it being a better radiator, and (ii) to the increased power required. Measurements show that for equal effect on the distant receiver a single-phase and earth connection radiates approximately five times as much energy as does an interphase one.

A system which is a good radiator of h.f. energy is also a good absorber, and consequently an interphase system is less likely to be disturbed by radio stations working on frequencies near those used for the communication channels.

I am unable to agree that an interphase system is liable to twice the chance of breakdown. If one of the coupled phases on an interphase system breaks, communication will still be possible without having to revert to single-phase and earth operation on the sound phase. In some recent tests carrier sets were connected to the red and blue phases of a transmission system. With both the red and blue wires intact, 21 per cent. of the normal input at the sending end was sufficient to produce reliable operation of the signalling mechanism at the receiving station. With the blue phase intact and the red broken and earthed (simulating a fallen conductor) 62 per cent. of the normal input was required to give the same result at the receiving station. Hence, with normal input, communication would not have been interrupted.

In a single-phase and earth system the breaking of the coupled phase wire is very serious. On test, 48 per cent. of the normal input gave satisfactory reception with the phase wire sound, but when broken and earthed sixty-five times the normal input failed to produce satisfactory operation at the receiver (in the test the transmitter used could not deliver sufficient power to produce reliable reception). This goes to show that a single-phase and earth system would have failed if the coupled phase wire had broken.

Again, I must disagree with the author of the articles referred to when he states that the effects of hoar frost and snow on the lines are more marked on an interphase system. I have no direct experimental data to support my criticism in this case, but from inquiries I have made concerning the operation of high-frequency systems in Germany it is clear that experience in that country has shown that ice on the lines seriously affects telephone transmission when single-phase and earth connections are employed, but where interphase coupling has been used no trouble has been experienced when the lines are ice coated.

I should say, therefore, that when the advantages and disadvantages are summed up, there are weighty technical advantages to be gained from the use of interphase coupling, namely, less radiation interference (transmitting and receiving) and greater reliability during breakdown of lines and ice coating. These advantages offset the extra cost of additional coupling equipment, which is, after all, only part of the whole cost. It is, of course, difficult to appraise the value of increased reliability in terms of increased capital cost, but cases have arisen (and will probably become more frequent) in which the prescriptions of the authorities as regards radiation, in conjunction with the high-frequency attenuation of the line, have prohibited the use of single-phase and earth coupling. Further, development in Germany and the United States is practically confined to the interphase (or intercircuit) system.

Under the heading of "Principles of Transmission," Mr. L. S. Crutch's article contains values for the inductance and capacity of a certain line. Using the formulæ I usually employ and taking his geometrical dimensions of the line, I obtain twice the inductance and half the capacity which he gives, and consequently a characteristic impedance of 775 ohms, which is very near the measured value.

The high-frequency resistance of stranded conductors is a variable quantity, and I hesitate to give figures. The larger the conductor and greater the number of strands, the greater the ratio $\frac{\text{(high-frequency resistance)}}{\text{(d.c. resistance)}}$ becomes. I have seen published figures for power lines where this ratio is given as 27. A very fair figure for the attenuation of an interphase system is 0.1 decibel per route mile at 100 kilocycles per second.

Mr. Crutch deals with the question of communication on the radial, or cartwheel, principle. Cases must arise in which tandem working is necessary and often compulsory. To provide telephony, remote control, supervision, and remote metering on a tandem system is not easy, but it has been successfully accomplished.

* "Communication over Power Lines," September 11th issue, p. 387, and "High-frequency Telephony," September 25th issue, p. 465, by L. S. Crutch.

Metal-surface Treatments

Rustproofing and Paint-priming Processes for Iron and Steel

AT the works at Brentford, Middlesex, of the Pyrene Co., Ltd., a large gathering of manufacturers and Press representatives witnessed, on Thursday last week, demonstrations of the metal-surface treatments, "Parkerizing" and "Bonderizing," which are operated under licence from the company. "Parkerizing" is a system of commercial rustproofing of iron and steel involving the immersion of parts in a solution made up of boiling water and "Parco" powder. The parts should remain in the solution until the reaction ceases, a period of about sixty minutes, after which no chemical action can take place, and there is thus no risk of spoiling the metal if it is left in the solution. No attention is required during the treatment. The process converts the surface of the metal into an insoluble phosphate impervious to rust under ordinary atmospheric conditions, when the surface is ready for a final finish to complete the rust-proofing. This can easily be effected by wiping the parts with, or dipping them in, oil, although a range of Parker finishes is available to suit various conditions and requirements, and to provide, where required, a variety of attractive finishes. The sequence of operations is: cleaning the parts for treatment (including the removal of oil and grease); de-scaling (if necessary); immersion in solution; application of oil or other finishes. The treatment in no way affects the contour, shape, temper, or the physical properties of the metal. The growth of parts during treatment is said to be less than two ten-thousandths of an inch. Half a pound of powder is required to 1 cwt. of parts. The process is not impeded in any way by the parts touching, and rotary motion is used only to speed up the process. If the surface is removed at one part the resultant rust will not spread.

"Bonderizing" has been developed to speed up production. It is a chemical priming process for changing the surface of iron or steel to a non-metallic coating which is an integral part of the metal and is sufficiently absorbent to ensure permanent cohesion with applied paint, lacquer, or enamel. The process is similar, except that the period of treatment is considerably shortened (ten minutes), the parts being immersed in a solution made up of boiling water and "Bonderite" powder. The process converts surface rust, seals the pores of metal, and provides a chemically clean, smooth, and yet absorbent surface. The sequence of operations is: cleaning of parts (removal of oil and grease); immersion in the solution; rinsing in boiling water; drying; and application of finishing paint, etc. Although it is claimed that the surface is non-metallic, there is a small copper base in it, and therefore paint with a metallic base should not be applied to it—this is not the case with the "Parkerizing" process. Sand-blasted material will become "Bonderized" two or three minutes sooner than ordinary hard-skin material.

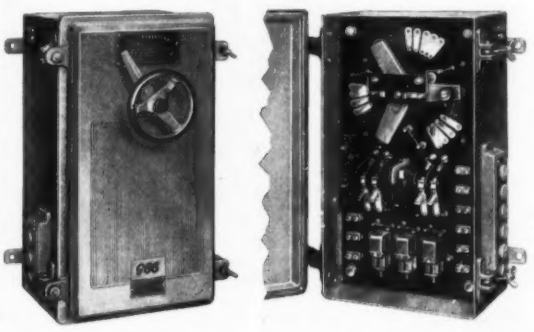
While the main object of the company is to supply the powders, it also supplies the necessary equipment or the design for any installation.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Air-break Rotor Starting Panels

A new range of air-break rotor starting panels, suitable for starting three-phase slip-ring motors up to 20 h.p. at 220-440 volts has been placed on the market by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. Two sizes are available, the smaller one for use in conjunction with motors up to 10 h.p. taking stator and rotor currents of 10 and 70 A, respectively, and the larger one for motors of 7½ to 20 h.p. taking stator and rotor currents of 30 and 70 A, respectively. The starting panel comprises a four-pole stator contactor, three magnetic overload relays fitted with oil-filled dashpots, and an air-break face-plate rotor starter. The equipment is mounted on a slate panel at the back of which the rotor starting resistance is fitted, and the whole panel is enclosed in a mild-steel case provided with a cast-iron cover on which is mounted an



Exterior and Interior of G.E.C. Air-break Rotor Starting Panel

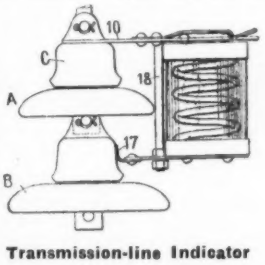
instruction plate. The motor starter is electrically interlocked with the contactor. The contactor is actuated by a push-button built into the centre of the starting handwheel, and the operating coil is protected by two fuses. On pressing the push-button the contactor closes and connects the stator of the motor to the supply. The handwheel is then moved slowly to the running position, the push-button being pressed down until the starting resistance is cut out. To stop the motor the handwheel is moved to the "off" position, the contactor immediately breaking the stator circuit. For cabling purposes wood bushes are normally provided, but, if desired, arrangements can easily be made for conduit, or cable glands with or without sealing boxes fitted. The starters are compactly designed, neat in appearance, and robust, and the overall dimensions of the smaller size are only 15in. wide, by 22½in. high, by 13¼in. deep.

Multi-range Pocket Meter

A new British-made multi-range radio pocket meter by the RUNBAKEN MAGNETO CO., 280, Deansgate, Manchester, embodies the following features: moulded "Bakelite" case; a rotary switch affording three ranges, 0-150 V, 0-6 V, and 0-30 milliamperes; exceptionally "dead beat" movement; and an engraved scale. The internal resistances of the instrument are 5,000 and 2,000 ohms.

H.P. Transmission-line Indicators

A good deal of attention is being devoted to indicating to the users of aeroplanes during night-time flying the proximity of overhead cables and wires that may prove a source of danger, and in this connection the SOCIÉTÉ DE LA PORCELAINERIE DE LESQUIN has recently taken out a patent for a safety signal, comprising a neon tube which emits a light capable of penetrating mist and fog. It is proposed that a series of such signals should be installed along the length of a transmission line, so that they would not only indicate the existence of the line, but also the direction in which it runs. The signal is mounted in conjunction with the supporting line insulators in such a way that it may be operated by the current leakage about the insulators or by a distinct source of current, so that any connection with the transmission line for this purpose is unnecessary. The illustration is a side elevation of the arrangement. The usual line-supporting insulators A and B are each surmounted by metallic caps C and D to which suitable brackets 10 and 17 for the support of the neon light are secured. The light itself is made in the form of a helix in such a way as to give it a high inductance.



Transmission-line Indicator

Shop-window Lighting Reflectors

The WHOLESALE FITTINGS CO., LTD., 23, Commercial Street, E.1, has recently marketed a range of mirrored-glass shop-window reflectors and spotlights under the name of "SP Altoray." High-quality crystal glass is used, heavily plated with pure silver, backed with copper, and finally reinforced with aluminium electrically treated. The construction embodies a scientific combination of vertical and horizontal flutes which long research has proved to give not only the most powerful reflection, but also to disperse intense light uniformly over the prescribed area. The construction is so robust that the suppliers give the exceptional guarantee that the reflector will neither peel nor lose colour within seven years. The reflectors can be supplied in a number of shapes and sizes for use with 100- and 150-W lamps to suit every shop-window. Each spotlight is supplied with a well-ventilated nickel-plated gallery permitting swivel and trunnion movement, and also an adjustable lampholder.

"SP Altoray" Reflector

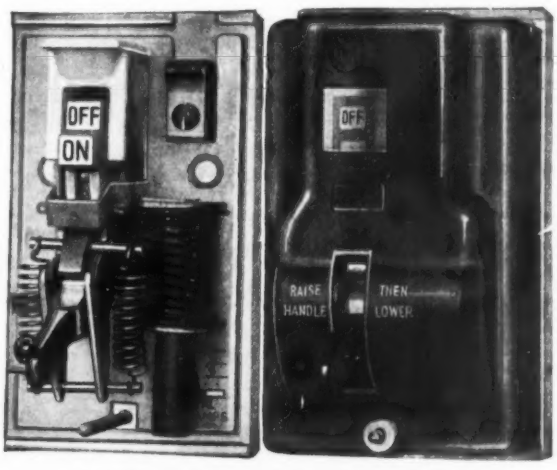
Miniature Circuit Breakers

A pleasing thing about the new miniature circuit breakers of J. G. STATTER & CO., LTD., 16, Great George Street, S.W.1, is their superiority to foreign makes we have seen. One of the principal features is that the free-handle mechanism is positively both quick-make and quick-break. The general conclusion follows very closely accepted large circuit-breaker practice. The base is of high-class porcelain, and the substantial contacts have a wiping action and are of the self-cleaning type. Powerful magnetic blow-outs ensure high rupturing capacity, and steatite arc shields restrict the play of the arc. The operating mechanism is built entirely of hardened-steel metal stampings.

The magnetic-type overload trip is calibrated from 75 per cent. to 200 per cent. of full-load current, with intermediate markings, and an adjusting screw and pointer are provided, so that individual calibration between the above limits may be readily obtained.

If desired, a bi-metallic time-lag device can be fitted to the overload trip, contained in the base. This consists of a bi-metal strip in shunt with the overload coil.

The moving contact of the breaker is fitted with a steatite moulding carrying the words "On" and "Off" which can be observed through a window. The operating handle is of metal covered with a moulded insulating material. By drilling a hole in the handle two or more s.p. breakers may be coupled together by a connecting rod, or the breaker could be remotely controlled by some such means as Bowden cable. The brown moulded "Bakelite" cover has an excellent and pleasing finish. Substantial terminal blocks of the quick-grip type are provided. "Knock-out" holes are provided in the cover to suit any method of connection. The breakers are made in various standard sizes up to 30 A capacity in s.p., d.p., and t.p. patterns. The s.p. pattern as described is of the all-insulated type, but the d.p. and t.p. patterns are standardised in ironclad cases.



The Statter S.P. Miniature Circuit Breaker

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"J. & P." in China

In his article in our last issue, Prof. C. A. Middleton Smith complained that British manufacturers took too little interest in the Chinese markets. There are, of course, exceptions to every rule, and several British electrical manufacturing concerns must be exempted from the scope of this dictum. For instance, we have received from Messrs. Johnson & Phillips, Ltd., a copy of a brochure which they have recently produced for their Shanghai agents, the China Engineers, Ltd. This is in the language of the country, which precludes us from passing judgment upon the subject matter, but we have no doubt that it is of an effective character.

The Lord Mayor's Show

The Lord Mayor's Show, for which arrangements are now being made, will include much of electrical interest. According to *The Times*, the Lord Mayor-elect desires the pageant to tell the story of the assistance given to trade and commerce by the research work of the scientists. Among the details with which it is hoped to deal are electric lighting and cooking, the cinema, wireless telegraphy and cables, transport, especially motors, and the internal combustion engine.

More Floodlighting Installations

Particulars have reached us of a number of further interesting floodlighting installations carried out in connection with the Faraday Centenary Celebrations. Of numerous experiments undertaken by the Shropshire, Worcestershire and Staffordshire Electric Power Co., particularly effective results were obtained at Tewkesbury Abbey, Smethwick Council House, Evesham War Memorial, Holy Trinity Church, Stratford-on-Avon, and the company's central offices, while a good deal of attention and favourable comment was also occasioned by the illumination of Shakespeare's birthplace at Stratford-on-Avon. At Wallasey the Corporation Electricity Department is to be congratulated on its floodlighting of the War Memorial, and the night view of the Town Hall from the River Mersey was very impressive. Singular light and shade effects were obtained by the Rochdale Electricity Department at the Town Hall, while "Electric House," illuminated in colour, was very striking. The North Metropolitan Electric Power Supply Co. carried out installations at a number of points of interest in its area, including churches, local authorities' public offices, and its own showrooms at Wembley, Edgware, and Tottenham. The floodlighting of the Science Museum, South Kensington, undertaken by the Office of Works for the final meeting of the British Association on September 30th, was provided by ten 1,000-watt "Holophane" floodlights, and proved very effective. In connection with the Barking Charter Celebrations the County of London Electric Supply Co., Ltd., supplied the Corporation with the street illuminations and the lighting for the Pageant arena, the Curfew Tower, and the old Parish Church, relics of the past glories of the town, being among the buildings floodlighted. Floodlighting with coloured lights was used in the shrubberies in the Boulevard along Longbridge Road, which skirts the park on one side, while the apparatus used to floodlight the amphitheatre in the park for the evening performances of the Historical Pageant was the same as that employed for the recent illuminations at Somerset House. A very pleasing result was also obtained by the General Electric Co., Ltd., with the floodlighting of the garden at the Grove, Marton-in-Cleveland, Yorks.

A Faraday Window Display

The window display of the Brompton and Kensington Electricity Supply Co., Ltd., during the recent Faraday celebrations was an extension of the E.D.A. Faraday window suggestion. The company's display occupied two windows, one showing an early Victorian room with the domestic appliances in use in 1831, while the other had an array of electrical domestic appliances, the centre piece being a built-in "Magicoal" electric fire. The two displays are shown in the accompanying illustration.

French Electrical Imports and Exports

The official returns lately issued show that as a result of the industrial depression both the French imports and exports of electrical machinery during the first half of the current year underwent a decline. The imports attained a value of £2,678,184 as compared with £3,121,096 in the corresponding six months of 1930, while during the same period the exports declined from £2,184,648 to £1,907,488. It should be mentioned that owing to the recent fluctuations of the French franc due to the abandonment of the gold standard in this country we have continued to convert the official French totals at the rate of 125 fr. to the £.

Ex-Verity Association

The second annual dinner of this Association will be held at Gatti's Restaurant, King William Street, Strand, W.C., on Thursday, October 29th, commencing at 7 p.m. Full particulars of the Association will be sent to those qualified for membership, on application to the hon. secretary, Mr. W. M. Tribute, 229, Regent Street, W.1.

Wages in the Electricity Supply Industry

As a result of the decision of company and municipal undertakings in the Manchester area to reduce wages by 3s. per week as from October 15th, a special meeting of workers was held on Sunday last at the Engineers' Hall, Manchester. Mr. J. T. Watkins, who presided, said that national conferences had broken down, and that the employers refused to consider the position in the district councils. At the moment there was chaos: they had not heard of any notices being posted in the Manchester area, and until this was actually done, he suggested that they should take no action, but get ready for the strike if one was decided upon. For the Engineers' and Firemen's Union, Mr. C. E. Ross said that his organisation had definitely decided on resistance, while Councillor Kearns (Electrical Trades Union) said that the question of a reduction would be discussed by the Salford Electricity Committee during the following week, when the manifesto prepared by the unions would be considered. After further discussion the meeting decided to get into touch with the various municipal committees who would have the matter in hand.

The F.B.I. and the Financial Situation

In a statement issued by the Federation of British Industries comments are made on the tendency in some circles to suggest that the departure of Great Britain from the gold standard offers such advantages that industry has nothing to fear. This view, the Federation considers, is both foolish and dangerous. Other manufacturing countries exist whose internal position is not better than Britain's, and the currencies of these countries must also depreciate. Any special advantage that British industry may derive from the present situation can only be of a temporary character, and it is essential that steps should be taken both to cut down many items purchased from abroad and which the country can no longer afford to buy, and also to increase the quantity of goods exported. As a means of attaining these aims it is suggested that a tariff should be introduced, which would have the effect of checking the flow of manufactured imports, keeping out an enormous volume of dumped goods that are now being rushed to Britain, and giving the country a real chance of reviving its industrial activities.

A Proposed Permanent Exhibition

It is reported that negotiations are proceeding for taking over the building in Oxford Street, W., formerly occupied by Gamages (West End), Ltd., for the establishment of an exhibition centre in which manufacturers from all parts of the country and the Empire would be displayed all the year round. The exhibits would include engineering and electrical products.

The Brompton and Kensington Co.'s Window Display

The R.A.E. Club

The R.A.E. Club was officially opened on October 5th. This is a social club for members of the radio, automobile and engineering industries. During the proceedings, Sir Anthony Dering pointed out the immense scope for British trade that could be brought about by engineers meeting together and interchanging views. He could only speak from the electrical engineering side, but he felt sure the engineering industry as a whole would be in agreement as regarded co-operation amongst British firms. At this time of intense foreign competition, it was essential for British industries to work together, and this could be done by co-operation during working hours and after them, and for the latter a club of this type would be most helpful. The secretary will be pleased to send particulars of the club on application to him at the R.A.E. Club, 3, Leicester Square, W.

Australian Tariff Changes

The Australian Government has made the following tariff amendments: Loud-speakers: British preferential tariff, 10s., intermediate tariff 11s., and general tariff 12s. 6d., as against the former British preferential tariff of 50 per cent. *ad valorem*, and the general tariff of 65 per cent. *ad valorem*. Variations have also been made in the tariffs for parts of loud-speakers, and for combined wireless receiving sets and gramophones. The new duties on storage batteries for wireless receiving sets and motor cars are: British preferential tariff 50 per cent., intermediate tariff 57½ per cent., and general tariff 70 per cent., against the former British preferential tariff of 40 per cent., and the general tariff of 60 per cent. Changes have also been made in the duties on component parts of batteries.

Electric Cookers in a Pageant

At the recent jubilee celebrations held at Southgate, the programme included a pageant in which a feature was a display of "Belling" Cookers. The accompanying illustration shows the tableau, which consisted of eight all-enamel cookers made by Messrs. Belling & Co., mounted on a lorry, and, as will be seen, the display was backed up by forceful slogans.

HAPPY LADIES HIRE
BELLING ELECTRIC COOKERS
FROM NORTHMET
IN 1881 THEY COOKED BY COAL-RANGE
IN 1931 YOU COOK BY ELECTRICITY

A "Belling" Tableau

The Timber Market

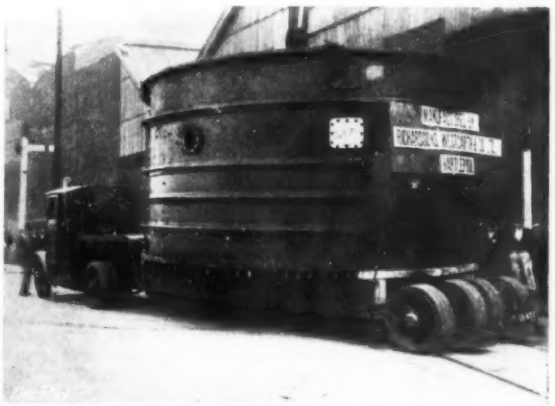
Our Timber Trade Correspondent says that as in most affairs, financial and industrial, some remarkable changes have occurred in the timber trade of this country during the past month. European shippers have endeavoured to obtain orders on old currencies and even on a dollar basis. Stocks in the country, however, are large at present rates of consumption, whilst the large supplies still in shippers' hands will be a drag on producing countries during our holding off. But on the spot the conditions now ruling have rendered the market much more steady than heretofore, and it is likely to become firmer. The comparatively higher foreign shippers' prices apply also to hardwoods, particularly those of American production, but here again stocks are large whilst consumption has been light. Mahogany also is firmer, but there is little world demand for this wood. In view of foreign suppliers' efforts to stand by gold standard quotations, wood consumers would do well to consider purchasing native woods, which for their class of work are unsurpassed.

German-American Co-operation

A visit to the United States is being paid by Herr von Siemens to confer with the American General Electric Co., the Telephone and Telegraph Corporation and the Western Electric Company concerning further co-operation between the American and the German electrical industries. As the General Electric Company holds a minority block of shares in the Berlin A.E.G. and the remainder of the latter's shares are distributed over a large number of owners so that no majority holding exists, the journey of the representative of the Siemens concern is said to be connected with the possibility of bringing about a community of interests between the German Siemens group and the A.E.G.

Condensers for Newcastle

Three 40,000 sq. ft. cooling surface condensers are being supplied by Messrs. Richardsons, Westgarth & Co., Ltd., for the Dunston "B" power station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. The shells for these are of the fabricated electrically welded type, and they are so large that it has been found necessary to build them in two portions and then joint them up on site. The shells are too large for rail transport, and the accompanying illustration shows one half shell leaving the company's works for road transport to Newcastle.



Richardsons, Westgarth Condenser Shell for Newcastle

Jugo-Slavian Electrical Imports

The remarkable development which has taken place in the electrification of Jugo-Slavia, as well as the carrying out of the extensive electrical programme which the Government has in hand, has given considerable impetus to the importation of electro-technical machinery and supplies. In proportion to the total imports of the country, these rose in weight from 2.5 to 3.2 per cent. when the first half-years of 1930 and 1931 are compared. For these two periods the figures were respectively: Weight, 18,530 quintals in 1930 and 21,303 quintals in 1931; value, 90,210,000 dinars in 1930 and 82,709,000 dinars in 1931. The chief supplying countries in the first six months of 1931 were: Germany, 7,836 quintals (6,735 in the corresponding period of 1930); Austria, 6,263 quintals (5,697); Czecho-Slovakia, 2,528 quintals (1,690); France, 1,318 quintals (848); and Hungary, 1,224 quintals (381). It will be observed that while the import weight has increased appreciably, the value is considerably less.

Newfoundland Trade Commissioner in London

The Department of Overseas Trade announces that Mr. H. F. Gurney, H.M. Trade Commissioner in Newfoundland and the Maritime Provinces of Canada, is now in this country on an official visit. Mr. Gurney will be available at the offices of the Department during the period October 19th to 23rd to interview manufacturers and merchants interested in the export of British goods to Newfoundland and the Maritime Provinces. He will also visit a number of industrial centres in the provinces. Firms desiring interviews with Mr. Gurney in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General of the Department, 35, Old Queen Street, London, S.W.1, quoting the reference 5930/1/31.

A G.E.C. Window Display

At the present time when buyers are being urged to assist Home industries by "buying British," the accompanying illustration received from the General Electric Co., Ltd., of one of its current series of special windows at Magnet House, Kingsway, W.C., is of interest. It will be seen that the cooker display is effectively linked up with the patriotic appeal "Buy British and be Proud of it."

A "Magnet" Cooker Display

Registered Electrical Contractors

Applications for registration from the following contractors were accepted at the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors:

Milne and Longbottom, Rochdale.
Hayes, A. G., Richmond.
Collins, E. F., Croydon.
Cole, G. H., Worthing.
Broadbent, T. W., Ltd., Huddersfield.
Fenemore Howlett and Co., Ltd., Windsor.
Chapman, C., and Sons, Carmarthen.
Ridgers, P. A., Bracknell, Berks.
Taylor, I. C., and Son, Waterloo, Liverpool.
Walter Jones, Harvey and Co., Ltd., Swadlincote, nr. Burton-on-Trent.
Walton, J. E., Stockport.
Morris, H., Litherland, Liverpool.
Duckworth, A., Blackburn.
Groves, I., and Co., Southampton.
Knight, S. V., Hendon Central.
Slater, J., Blackburn.

At the same meeting one application was withdrawn and eleven were declined.

Ideal Home Exhibition, Cardiff

The Cardiff Corporation Electricity Department has taken a stand at the Ideal Home Exhibition to be held at Greyfriars Hall, Cathays Park, Cardiff, from October 23rd to November 5th. The stand is to be divided into three sections, furnished as lounge, dining room and kitchen. Electrical equipment will be lent by the leading electrical concerns of the city for the occasion.

School of Engineering and Navigation, Poplar.

In connection with the note in our last issue regarding the inauguration of the L.C.C. School of Engineering and Navigation at Poplar, we are informed that owing to the general election the function has been postponed and that H.R.H. Prince George will perform the opening ceremony on November 18th.

Bury Corporation Engineering Society

The "Improvement Class" of the Electricity Department of Bury Corporation proved so successful last year that it was decided to carry on the lectures this session by forming an Engineering Society which would also be open to engineers in the district.

The first meeting of the Society, at which 120 engineers were present, was held on October 8th, when Mr. E. W. Thompson, of John Thompson Water Tube Boilers, Ltd., exhibited a film and gave a lantern lecture on the "Design and Construction of Modern Boilers." Mr. Ruddock, of the same firm, also made some interesting comments, and showed several slides on stokers. The officers of the Society are Mr. J. G. Potts, A.M.I.E.E., president; Mr. V. Walker, A.M.I.E.E., hon. secretary; and Mr. F. Ashworth, hon. treasurer.

Crompton Parkinson's Deferred Payment Scheme

Messrs. Crompton Parkinson, Ltd., have made arrangements by which electricity supply undertakings, electrical contractors or engineering resellers can supply to their clients electric motors and other electrical equipment on hire-purchase terms. A folder giving details of the scheme has been prepared and copies can be obtained on application to the General Sales Dept. of the company, Bush House, W.C.2.

Economic Conditions in Sweden

The September issue of the *Swedish Economic Review*, in a report on the position in some of the main branches of industry during the second quarter of 1931, states that within the group ore-mining and metal industries, the mines still exhibited a very low employment figure, and in many places work had entirely ceased. During the first half of the current year the export of iron-ore declined to about 45 per cent. of the figure for the preceding year, and considerable contractions of operations occurred at the ore-refining works. Production was consistently lower than last year. In the mechanical workshops the position was uneven. Thus, while within certain industries the exports were equal to, or even exceeded, those of last year, others suffered severely from the depression. Work had to be restricted at the foundries in particular. Although short time was in force both at the shipbuilding wharves and within the electro-mechanical industry, yet employment within these industries somewhat improved. The value of exports for the first seven months of the current year of electrical machines was 13,157,000 kr., as compared with 20,080,000 kr. in the corresponding period of 1930, and of telephone and telegraph apparatus, 9,437,000 kr., as against 8,747,000 kr.

Brisbane Abandons Municipal Trading

The City Council of Brisbane, Queensland, has decided to abolish the trading section of its electricity supply department and to lease the showrooms to a private company. Substantial losses have been incurred in the municipal merchandising of electrical appliances through competition of private enterprises. Alderman Tait, in seconding the motion for the abolition of the trading department, said that the trading during the past year under more concentrated management had unfortunately simply confirmed the results of the previous year, when the turnover was £14,000 and the loss £7,314.

Argentine Tariff Increase

The Argentine Government has issued a decree imposing an additional 10 per cent. *ad valorem* duty on practically all imports as from October 9th for a maximum period of one year.

Australian Electrical Imports

There was a marked decline in the value of imports of electrical machinery and appliances into Australia during May last, as compared with the corresponding period of 1930, the figures being £123,310 and £416,362 respectively.

Electrical Engineering Progress in Soviet Russia

Based on a report of the head of the Electrotechnical Unions in Soviet Russia the *E.T.Z.*, in a recent issue, states that the first steam turbo-alternator of 22,000 kW capacity, and oil switches and transformers up to 115 kV, have been produced in Soviet Russia this year, while before the end of December next it is expected that 220-kV transformers will be produced. It is also stated that so far eight Soviet electrical engineering establishments have been working at the capacity set down in the Five Years' Plan. The announcement is also made that work is in hand on the establishment of an extensive electrical engineering centre in the Urals to comprise works for the manufacture of dynamos and motors, transformers, cables, and electrical apparatus, &c. At the Podolskev works operations have been commenced on the construction of 70-ton electric locomotives, and that provision is being made at these works for the manufacture of such engines up to a weight of 132 tons. Our contemporary also states that the extensions planned for the development of the electrical industry in Soviet Russia provide for an output next year 185 per cent. larger than in the current year.

New Catalogues and Lists

The FOSTER INSTRUMENT CO., Letchworth, Herts.—Leaflet No. 53, describing the "Resilia" pin mounting for electrical pyrometers.

HOLOPHANE, LTD., Elverton Street, Vincent Square, S.W.1.—List No. 224, giving illustrations, prices, and particulars of the "Hedralite" system of lighting fitting construction.

M. & C. SWITCHGEAR, LTD., Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlet C/1/1, illustrating examples of flameproof switchgear, control gear, and accessories.

The BRUSH ELECTRICAL ENGINEERING CO., LTD., Falcon Works, Loughborough.—A publication dealing with the company's rotary convertors.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—An illustrated booklet on automatic electrical machine control for generating and converting plant.

E. P. ALLAM & Co., LTD., 107-109, Gray's Inn Road, W.C.1.—A stock list of d.c. motors for sale, hire, or hire-purchase.

T. C. JONES & Co., LTD., 93-95, Wood Lane, Shepherd's Bush, W.12.—An abridged list of contractors' tools and an illustrated leaflet dealing with combined portable engines and saw benches.

The "TYPERLITE" Co., 86, Cannon Street, E.C.4.—A leaflet giving particulars and prices of "Typerlite" lighting fittings.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—An abridged stock list (No. 314) of a.c. motors.

C. A. PARSONS & Co., LTD., Heaton Works, Newcastle-on-Tyne.—A leaflet illustrating and describing the company's "Uniplane" turbo-generating plant.

BRITISH ELECTRIC LAMPS, LTD., Spencer Hill Road, Wimbledon, S.W.19.—A leaflet describing the "B.E.L.L." pearl gas-filled lamps.

The JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—The new season's catalogue of electric fires.

JOHN MOORE & Co., Ravald Street Works, Salford.—A 120-page illustrated catalogue of radio receivers and components. Also a price list (No. 931) of insulating materials.

Trade Announcements

The GENERAL ELECTRIC CO., LTD., has opened a new branch at Magnet House, 2, St. Aldate Street, Gloucester, of which Mr. J. Williams, formerly of Cardiff, is the manager. The telephone number is Gloucester 3527.

Mr. NORMAN GRAHAM, electrical installation engineer, has commenced business at Upperhead Mills, Huddersfield, and wishes to receive copies of catalogues and price lists.

MESSRS. HOLLINGS & GUEST, LTD., have removed the whole of their business to Cardigan Works, Belmont Row, Birmingham. Mr. G. N. Guest, managing director, is also managing director of Messrs. John Hands & Sons, Ltd., of Belmont Row, Birmingham, and it has been decided to combine the two businesses.

MR. A. TOPPING has taken over the business of Messrs. Ward & Booth, electrical engineers and accumulator makers, of Pritchard Street, Manchester.

Mr. F. W. Davies, Huddersfield, has taken his son, Mr. R. K. Davis, into partnership. The firm, which is to be known as FRED. W. DAVIES & SON, has acquired new premises at Longroyd Bridge, Huddersfield.

Mr. W. L. HAMBLY, lately sales engineer in the Cooker Department of the G.E.C., has joined Mr. E. Ellwood in the development of the sales side of the MANOR ELECTRIC OVEN & FIRE CO. Mr. H. Walford Thomas has been appointed the company's representative in the London area.

For Sale

Manchester Electricity Department invites tenders for the purchase and removal of motor convertors, motors, starters, etc.

Second-hand motors, meters, and transformers are offered for sale by Swansea Electricity Department.

(See our advertisement pages to-day.)

Book Notices

"Direct Current Machine Design," by A. W. Hirst. Pp. xii+175; figs. 76. London: Blackie & Son, Ltd. Price, 10s. net.

"Electrical Machinery and Apparatus Manufacture." Edited by Philip Kemp. Part 1. To be completed in about thirty weekly parts. London: Sir Isaac Pitman & Sons, Ltd. Price 1s. each part.

"The Smoke Abatement Handbook, 1931." Pp. 48. Published for the National Smoke Abatement Society by the Service Guild, 45, Deansgate Arcade, Manchester. Price 6d.

"Electricity for Coal-mining Students," by J. Stevenson and W. Miller. Pp. vii+250; figs. 117. London: Crosby, Lockwood & Son. Price 7s. 6d.

Recent Contracts

Messrs. Weaver & Co., Ltd., of Swansea, have placed an order with MESSRS. HENRY SIMON, LTD., Cheadle Heath, near Manchester, for a travelling pneumatic grain discharging plant, which is to be installed on the quay alongside Messrs. Weaver's warehouses at Swansea docks. The plant, which will be capable of discharging grain at a maximum rate of 180 tons per hour, will be mounted on a travelling steel braced tower fitted with traversing gear for moving the plant along the quay. The pneumatic equipment will include "Simon" standard reciprocating vacuum pumps, electrically driven, and pipe booms. There will also be a 2-ton "Reform" automatic grain weighing machine.

The GENERAL ELECTRIC CO., LTD., announces the receipt of one of the largest contracts for telephone equipment yet placed. It covers the supply and installation in London of another 10,000-line "Director" type automatic exchange, together with tandem equipment for the automatic routing of inter-exchange calls in the West London area. The new exchange will be named "Kensington" and is scheduled for completion in 1933.

The G.E.C. has also received a contract from the Ryhope Coal Co., Durham, for electrical equipment for three pits which are to be electrified. All the equipment will be manufactured in the company's works at Witton, with the exception of the cables, which will be made in the company's associated Pirelli-General factory at Southampton. A number of sub-contracts have also been placed with firms in the North-East.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, Etc.	Price Oct. 14th.	Fortnight's Inc. or Dec.
a Acid, Oxalic .. .. per lb.	5½d.	—
a Ammoniac, Sal .. .. .. per ton	£60	—
a Ammonia, Muriate (large crystal) .. ,,	£52	—
a Borax .. .. ,,	£17	—
a Copper Sulphate .. .. .. ,,	£25 10s.	—
a Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a ,, Perchlorate .. .. .. ,,	5½d.	—
a Shellac T.N. .. .. per cwt.	£4 5s.	—
a Sulphur Commercial .. .. .. ,,	£11	—
a ,, Roll .. .. ,,	£11	—
a Soda, Chlorate .. .. per lb.	3d.	—
a ,, Crystals .. .. .. per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks .. .. per lb.	3¼d.	—
METALS, Etc.		
b Aluminium, Ingots .. .. .. per ton	£95 to £100	£10 inc.
b ,, Wire .. .. .. per lb.	1/1 to 1/9	—
b ,, Sheet and Foil .. .. ,,	1/1 to 2/9	—
b Babbits Metal and Anti-friction Metals—		
Grade I .. .. per ton net	£124	£5 inc.
Grade II .. .. ,,	£88	£3 inc.
Grade III .. .. ,,	£50	£1 inc.
c Brass (rolled metal 2" to 12" basis) .. per lb.	7¾d.	—
c ,, Tubes (solid drawn) .. .. ,,	9¼d. to 10d.	—
c ,, Wire, basis .. .. .. ,,	8¼d.	—
c Copper Tubes (solid drawn) .. .. ,,	10¼d.	—
g ,, Bars (best selected) .. .. per ton	£75	—
g ,, Sheet .. .. ,,	£75	
g ,, Rod .. .. ,,	£75	
d ,, (Electrolytic) Bars .. .. ,,	nom.	—
d ,, ,, Sheets .. .. ,,	nom.	—
d ,, ,, Wire Rods .. .. ,,	nom.	—
d ,, ,, H.C. Wire .. per lb.	7d.	½d. dec.
f Ebonite Rod .. .. ,,	1/3 to 1/6	—
f ,, Sheet .. .. ,,	1/3 to 1/6	—
n German Silver Wire .. .. .. ,,	2/1	—
h Gutta-percha, fine .. .. .. ,,	nom.	—
h India-rubber, Para fine .. .. ,,	3¼d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
l ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig .. .. .. ,,	£15	15s. dec.
g Mercury .. .. per bot.	nom.	—
e Mica (in original cases) small .. per lb.	6d. to 3/6	—
e ,, ,, medium .. ,,	4/- to 8/-	—
e ,, ,, large .. ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings .. ,,	1/1¼d.	—
p ,, ,, drawn bars & rods ,,	1¼d.	—
p ,, ,, rolled strip & sheet ,,	1¼d.	—
p ,, ,, wire .. .. ,,	1/0¾d.	—
o Platinum .. .. per oz.	£9 19s.	—
d Silicium Bronze Wire .. .. .. per lb.	8¼d.	½d. dec
r Steel, magnet, in bars .. .. ,,	7½d.	—
g Tin, Block (English) .. .. .. per ton	£132 5s. to £133 5s.	£6 to £7 inc.
n ,, Wire, Nos. 1 to 16 .. .. per lb.	2/10	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Patent Restoration Application

Application has been made by Kenneth Trevellyck Hardman for the restoration of the patent granted him for an invention entitled "Improvements in or relating to wireless aerials," numbered 260,089, which expired on March 16th last.

The Manchester College of Technology

At this College on October 3rd, besides the presentation of 142 students for the Associateship of the College, Honorary Associateships were conferred upon Lord Eustace Percy, President of the Royal Institution, and upon Mr. K. Baumann, M.I.Mech.E., who is a director and chief mechanical engineer of the Metropolitan-Vickers Electrical Co., Ltd.

Bankruptcy Proceedings

A. W. Kingston, wireless manufacturer and engineer, Graham House, 9, Newman Street, W.—The public examination of this debtor was held on October 6th before Mr. Registrar Mellor at London Bankruptcy Buildings, the accounts showing total liabilities of £5,125 (ranking £4,202) and net assets of £863 after deducting £767 for payment of the preferential claims. Debtor stated that in 1919 he commenced business at 54, Tavistock Square, W.C., under the style of "Kingston & Lynes," and subsequently traded in succession at Manette Street, Charing Cross, and Graham House, Newman Street, W. Since August, 1930, he had been engaged upon the development, production and sale of a machine known as the "Kingston Home Recorder," invented by himself. He made plans for placing the machine on the market, and entered into an arrangement with the petitioning creditor under which witness sold the sole distributing rights for a cash consideration, and undertook to sell and deliver 10,000 machines at a fixed price and a share of profits on sales. In order to finance the manufacture of the machines the petitioning creditor advanced £2,500. In March last, when 3,500 machines had been delivered, the petitioning creditor ceased to take delivery of the machines, and pressed for the return of money advanced, in default of which he instituted these bankruptcy proceedings. The debtor attributed his insolvency to the decline in his engineering business owing to concentration on the "Home Recorder," and to non-acceptance of delivery of machines. The examination was concluded.

W. M. Pratt and **H. V. Clark** (trading as Magson Clark and Co.), electrical engineers, 165, High Street, Hornchurch, and 10, The Parade, South Benfleet, Essex.—The public examination of these creditors was held on October 7th at Chelmsford, when a statement of affairs was submitted which showed liabilities of £1,308, with assets estimated to realise £331. Pratt said that the business was unsuccessful owing to failure to obtain necessary supply of electricity. Clark stated that he was now employed as an electrical engineer. The hearing was adjourned.

W. F. Hurry (Bijou Portable Radio Co.), 157, Junction Road, Highgate, N.—Receiving order made October 1st on debtor's own petition. First meeting, October 14th, and public examination, December 10th, both at Bankruptcy Buildings, Carey Street, W.C.

H. E. Sandell, electrical engineer, 1, Sandpit Lane, St. Albans.—First and final dividend of 4¼d. in the £, payable October 23rd at the office of the Official Receiver, 29, Russell Square, W.C.

W. J. Lattimer, electrical engineer, 1, St. James Park, Croydon.—Application for discharge to be heard on November 19th at the County Court, Scarbrook Road, Croydon.

R. H. Chambers (R. H. Chambers & Co.), electrical engineer, Market Street, Dartford.—Trustee: Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., appointed October 6th.

J. W. White, radio and electrical engineer, 32, Castledene Road, Parkstone.—First and final dividend of 2s. 4d. in the £, payable October 27th at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton.

Company Liquidations

Edibell Sound Film Apparatus, Ltd.—Winding up voluntarily. Liquidator, Mr. E. Norton, Thames House, 3, Queen Street Place, E.C.

San Luis (Mexico) Tramways, Ltd.—Winding up voluntarily. Liquidator, Mr. A. C. W. Dermer, 24, Martin Lane, Cannon Street, E.C.

Martins (Heckmondwike), Ltd.—Particulars of claims by October 31st to the liquidator, Mr. C. D. North, 1, Brunswick Street, Batley.

Pelican Electric, Ltd.—Particulars of claims by October 31st to the liquidator, Mr. J. J. Reid, 94, Old Broad Street, E.C.

Steel, Peech & Tozer, Ltd.—Meeting, November 10th, at 16, Great George Street, S.W., to receive an account of the winding-up by the liquidator, Mr. H. P. Morrison.

Ramsbury Electric Supply Co., Ltd.—Meeting, November 9th, at 14, Old Jewry Chambers, E.C., to receive an account of the winding-up by the liquidator, Mr. C. A. V. Slade.

Electric Motor Supplies, Ltd.—Winding up voluntarily. Liquidator: Mr. F. White, St. Peter's Street, Huddersfield. Particulars of claims to the liquidator by November 2nd.

Dissolution of Partnership

Davison & Garrod, electrical engineers and contractors, Orwell Road, Clacton-on-Sea.—Mr. W. Davison and Mr. W. W. Garrod have dissolved partnership.

Winding-up Petition

Bloomsbury Wireless Co., Ltd.—A petition for the winding-up of this company has been presented to the High Court by the Fuller Accumulator Co. (1926), Ltd., and will be heard in London on October 19th.

Electricity Supply

Barking.—CANVASS AUTHORISED.—The Corporation Electricity Committee has authorised a systematic canvass of the whole of the houses in the town in which electricity is not yet installed.

Barrow-in-Furness.—MAINS AND SERVICES.—Sanction to the borrowing of £20,000 for mains and services has been received by the Corporation Electricity Committee.

CHANGE-OVER.—The Electricity Committee is to change over the system and pressure of the electricity supply in the Coniston area from 200 V. d.c. to 230 V. a.c. for lighting and 400 V. a.c. for power.

Birmingham.—STREET LIGHTING EXPERIMENTS.—As a result of experiments which are now being carried out in Hagley Road with various types of electric and gas lighting installations, electricity has been substituted for gas experimentally in several streets in the suburbs of the city.

Canada.—ST. LAWRENCE WATERWAY.—The long-talked-of international project for deepening the St. Lawrence River as a sea highway from the head of the Great Lakes to the tide water seems now in a fair way towards being begun. Mr. Bennett, the Canadian Premier, in the course of a statement, says that negotiations between the Governments of the United States and Canada for framing a treaty for the development of the St. Lawrence will be initiated at once. The initial stages of the treaty negotiations will be by a direct and verbal exchange of views between the two Governments. The Canadian Minister at Washington (Mr. Herridge) has returned to Ottawa, presumably to give the results of his recent conference with President Hoover. The project involves the deepening of the Upper St. Lawrence river channel to a good navigation depth by the construction of either one or two dams, and a concurrent hydro-electric power development of several million h.p. shared between Canada and the United States. According to engineering surveys the total capital investment will be more than £40,000,000.—*Reuter* (Ottawa).

Chesterfield.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £22,500 for hired wiring and meters.

Coupar Angus (Perthshire).—STREET LIGHTING.—The streets of Coupar Angus, hitherto lighted by gas, were last week converted to electricity supplied by the Grampian Electricity Supply Co., Ltd.

Croydon.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend distributor mains at a cost of £1,500.

Earby.—ASSISTED WIRING.—The Urban District Council Electricity Department has recently instituted a scheme of assisted wiring.

Edinburgh.—YEAR'S WORKING.—We have received from Mr. Edwin Seddon, engineer and manager of the City Electricity Department, a copy of his annual report, together with a statement of accounts, of the electricity undertaking for the year ended May 15th last. The total revenue amounted to £732,694, while the working expenditure totalled £514,074, thus leaving a gross profit of £218,619. The corresponding figures for the preceding year were: Income, £675,564; working expenses, £503,388; gross profit, £172,176. To the gross profit was added income from other sources, making a total of £219,720, from which the following items had to be met: Sinking fund contributions, £82,039; interest on loans, £56,281; and income tax, £19,357. There remained a net surplus of £62,043, which compares with £91,001 in the preceding year. During the period under review, the capital expenditure amounted to £244,773, the principal items of which were £167,878 for the Portobello generating station and £62,456 for mains; the total now spent on the undertaking is £4,922,849. Increased consumption of electricity for all purposes was recorded, the total energy sold rising from 122,734,993 to 131,852,893 kWh; nearly four million kWh was supplied to the Central Electricity Board. Steady progress was made in the use of electricity for domestic heating, and Mr. Seddon regards this class of load as the most promising from the point of view of increased business in the future. The maximum load was 56,000 kW, an increase of 2,000 kW over the previous year. Although the Central Scotland Scheme was officially inaugurated by the Central Electricity Board on April 30th, 1930, a supply from Portobello station was not actually required until October last; it was not, in fact, until January 1st that Portobello was operated as a "selected" station.

Egypt.—ASSOUAN DAM PROJECT.—A proposal to utilise the Assouan Dam for the generation of electricity is again being considered by the Egyptian Ministry of Public Works. The variation of the overflow of the dam during different periods of the year would make an a.c. supply impossible, and attention is therefore being turned to the practicability of generating d.c.—*Reuter* (Alexandria).

Guildford.—PROGRESS OF ELECTRICITY UNDERTAKING.—In a review of the growth of the electricity undertaking since it was acquired ten years ago, Alderman J. Brunsdon Rapkins, chairman of the Electricity Committee, says that the sale of electricity increased from 990,092 kWh in 1921-22 to 6,039,718 in 1929-30 and 8,041,927 kWh in 1930-31. The number of consumers has risen steadily until to-day there are 6,102 connected. Revenue for 1930-31 amounted to £70,868, as compared with £57,796 in the preceding year, while the gross profit amounted to £38,411 (£26,869). There was a net profit last year of £10,296, as against £2,957 in 1929-30. The average price obtained per kWh has fallen from 6.14d. in 1921-23 to 2.05d. in 1930-31.

ASSISTED WIRING.—The Town Council has applied for sanction to a loan of £10,000 for the assisted-wiring scheme.

SUPPLY TO COMPTON AND GODALMING.—The Council has agreed to the granting of an Order enabling the Mid-Southern District Utility Co. to supply electricity in portions of the parishes of Compton and Godalming Rural, subject to the Order being revoked when the Corporation is able and willing to give the supply.

Gelligaer.—SUPPLY TO BEDLINOG.—A supply of electricity provided by the Urban District Council was inaugurated recently at Bedlinog.

Grimsby.—YEAR'S WORKING.—In his annual report on the working of the Corporation Electricity Department, Mr. S. R. Windle, borough electrical engineer, states that the sales of the electricity increased from 16,920,908 to 20,107,465 kWh, and the average price obtained per kWh was 1.4d., as compared with 1.45d. in the previous year. The maximum demand rose from 7,078 to 8,001 kW. Revenue increased from £102,032 to £116,816, while the total working expenditure was £62,295, as against £58,412. The gross profit amounted to £54,522, as compared with £43,620. Interest on loans, sinking fund, etc., accounted for £42,381 (£32,003), thus leaving a net surplus of £12,141 (£11,617). During the year the capital expenditure amounted to £81,444, of which the principal items were £19,360 for machinery and £33,351 for mains and services; the total now spent on the undertaking is £731,405. New consumers numbered 1,964, making a total of 10,843 now connected.

Hove.—YEAR'S WORKING.—At a meeting of the Hove Town Council held last week, Alderman Nye, in presenting the statement of accounts of the Electricity Committee for the past financial year, said that the undertaking had carried forward a balance of £30,312, but it was left with a deficit of £652 on the year's working. Two years ago it accumulated a much bigger reserve than it should have done and consequently it had deliberately reduced the charge for electricity so that it would make a loss. Energy sold during the year amounted to 8,480,236 kWh, an increase of 2,005,484 kWh as compared with 1929-30, while the number of consumers increased from 9,315 to 10,232.

Hull.—THE ELECTRICITY SUPPLY QUESTION.—At a recent meeting of the Corporation Electricity Committee it was reported that a deputation had been received by the Central Electricity Board with regard to the request for the extension of the generating plant at Sculcoates power station. The officials of the Central Board pointed out that there was already a considerable amount of excess plant in the Mid-East England area, which would be available as soon as the grid scheme was completed, and it was expected that the section to Hull would be in operation this month. Since the interview a letter has been received from the Board promising to give further consideration to the matter if raised again twelve months hence. After full consideration the engineer requested the Board to put into operation the section of the 1926 Act, under which the whole of the supply of electricity generated at Sculcoates would be sold to the Board and the Department would buy back all the energy required for its own supply. The action of the engineer was approved.

NEW SUB-STATIONS.—The Corporation Electricity Committee is to erect three new sub-stations.

Ilford.—YEAR'S WORKING.—A very satisfactory year is recorded in the accounts of the Corporation electricity undertaking (engineer: Mr. A. H. Shaw) for the twelve months ended March 31st last. Revenue showed a substantial increase from £166,558 to £197,448, the working expenditure rising only £18,216 to £139,048. The gross profit amounted to £58,400 (£45,726), and after providing for capital and other charges, there was a net surplus of £15,894, as against £4,287. A sum of £85,381 was spent during the year on capital account, bringing the total capital expenditure to £769,734, of which £285,395 has been repaid. The total capital expended on hire and hire-purchase of electrical installations and apparatus at the end of the year was £51,000, the revenue from these sources amounting during the year to £11,527. Sales of electrical energy amounted to 23,543,267 kWh, a record increase of 3,535,188 kWh. There was also a record increase of 3,155 in the number of consumers, making a total now connected of 23,543.

Lampeter.—SPECIAL ORDER.—The Electricity Commissioners recently informed the Town Council that as a result of the recent inquiry at Carmarthen respecting the Cardiganshire Electricity Special Order, they had decided in principle to grant the Order. It was added that the promoters had agreed to acquire the non-statutory undertaking at Lampeter. Under the circumstances the Council has withdrawn its objection.

Liverpool.—NEW SWITCHGEAR.—New switchgear to cost £4,800 is to be installed at the Lister Drive power station.

London.—HACKNEY.—The Borough Council Electricity Committee is to apply for sanction to the borrowing of £12,000 for service lines and £9,000 for meters.

BERMONDSEY.—The accounts of the Borough Council electricity undertaking for the past year show a net profit of £19,881.

ISLINGTON.—In spite of reductions in charges for electricity, the revenue of the Borough Council Electricity Department (engineer: Mr. A. P. MacAlister) for the year ended March 31st last increased from £251,032 to £301,209. Working expenses, however, rose from £127,674 to £183,380, the gross profit being £117,829 as against £123,358 in the preceding year. After deducting capital and other charges there was a net surplus of £50,666 as compared with £49,344 in 1929-30. So far as generating costs are concerned the above are the last comparable figures, as in future years all generating costs will be dependent on the working agreement with the London and Home Counties Joint Electricity Authority. Capital expenditure during the year amounted to £65,642, of which £40,197 was for mains and services; the total now spent on the undertaking is £1,407,208. The total sales of electricity rose from 31,995,742 to 35,192,121 kWh, the lighting consumption recording an increase of over 1½ million kWh. The maximum load was 22,276 kW, as against 20,295 kW, and the number of consumers increased by 3,152 to 18,581.

SHOREDITCH.—The accounts of the Borough Council electricity undertaking (engineer: Mr. W. Weekes) for the past year record a total revenue of £188,184 and a working expenditure of £100,664, thus leaving a gross profit of £87,519. To this was added income from other sources making a total of £91,194 available. Interest on loans absorbed £21,032, sinking fund contributions £40,591, and other items £11,741. There remained a net profit of £17,830. During the year £92,975 was spent on capital account, bringing the total now invested in the undertaking to £1,045,339. Electrical energy sold increased from 22,320,320 to 23,001,386 kWh and the maximum supply demanded from 12,778 to 13,759 kW.

Loughborough.—LOAN FOR METERS.—The Town Council is to apply for sanction to a loan of £10,000 for meters required during the next three years.

Manchester.—PROGRESS DURING JULY AND AUGUST.—During the months of July and August the Corporation electricity undertaking showed an increase of 5,569 kW in connections, bringing the total up to 456,148 kW. It is interesting to note that of 2,546 kW connected in August, 2,394 kW was for heating and cooking. Applications received for supplies, including additional supplies, amounted to 3,106, representing a total of 6,654 kW. The number of hired cookers increased by 284, making a total of 8,183 now on circuit; applications for the hire of cookers numbered 367. Five new sub-stations were put into commission and new plant was installed in five existing stations. The change-over from d.c. to a.c. had been completed in the cases of 16,867 up to August 31st, while work was in progress involving 1,038 consumers.

ASSISTED WIRING.—The Corporation Electricity Committee has approved and adopted a report by Mr. H. C. Lamb, the chief engineer and manager, on the hire purchase of wiring installations, with the provision that the consumer may have the option of entrusting the installation work to the Corporation to be undertaken by direct labour.

Nelson.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer: Mr. G. F. Nayler) for the twelve months ended March 31st last, show a total revenue of £84,468, and a working expenditure of £54,163, leaving a gross profit of £30,304. The corresponding figures for the preceding year were: Total income, £81,589; working expenses, £51,117; gross profit, £30,472. After deducting capital and other charges there was a net profit of £4,491, as against £7,387 in the preceding year. During the year the capital expenditure amounted to £32,600, making a total of £421,576 now spent on the undertaking. Electrical energy sold increased from 10,515,158 to 10,878,998 kWh, and the maximum supply demanded from 4,720 to 5,280 kW.

Newport (Mon.).—YEAR'S WORKING.—The Corporation electricity undertaking (engineer: Mr. A. Nichols Moore) records a slight decrease in revenue for the year ended March 31st last the figures being £193,505, as against £198,394 in 1929-30. Working expenses amounted to £99,254, as compared with £102,025, while the gross profit fell from £96,369 to £94,251. After meeting all loan charges, income tax, &c., there was a net surplus of £145, as compared with £5,936 in 1929-30. Capital expenditure during the year amounted to £53,876, bringing the total now invested in the undertaking to £1,296,785. Sales of electricity decreased from 35,174,777, to 31,747,440 kWh, the average price obtained per kWh being 1.330d. as against 1.231d.; the maximum demand was 13,000 kW, a decrease of 700 kW. During the year 1,211 new services were laid and connected, and there was a steady development in cooking and general domestic power requirements, the total number of cookers connected at March 31st last being 4,355, an increase of 518.

New Zealand.—SUPPLY IN HAWEN DISTRICT.—The institution of an electricity board to provide for the supply of energy in the Hawen district is under consideration.

Peterborough.—BULK SUPPLY.—The Town Council has decided, subject to the consent of the Electricity Commissioners, to enter into an agreement with the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., to give a supply of electricity in bulk from the power station for a period of fifteen years at £4 per kW. per annum of registered demand, plus 0·3d. per kWh consumed.

Plymouth.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to loans of £20,814 for switchgear, cabling, &c., and £86,943 for boilers, tubro-alternators, &c.

MAINS EXTENSIONS.—Mains extensions costing £5,500 have been authorised by the Corporation.

Portsmouth.—EXTENSIONS.—The Corporation Electricity Committee is to apply for sanction to a loan of £9,700 for the purpose of giving a supply of electricity to Denmead, Funtington and Ashling.

Price Reductions.—Reductions in the charge for electricity have been made or recommended in the following districts:—

LOUGHBOROUGH.—Lighting: From 5d. to 4½d. per kWh. Rateable value tariff: "Unit" charge reduced from ¾d. to ½d. for 500 kWh per quarter, if 750 kWh is guaranteed. Domestic (not rateable value) tariff: From 1d. to ¾d. per kWh, if 750 kWh is taken instead of the existing 500 kWh; all energy above 750 kWh reduced from ¾d. to ½d. per kWh. Industrial power: A reduction of 1d. per kWh.

GUILDFORD.—Lighting: Up to 500 kWh per quarter, town area, from 6d. to 5d. per kWh, rural area from 7d. to 6d.; beyond, 3d. and 4d. kWh respectively. Heating and cooking: 1d. per kWh in the borough (no change), and 1½d. in the rural area (a reduction of ½d.). Power: Up to 500 kWh per quarter, town area, from 2d. to 1¾d., rural area from 2½d. to 2¼d.; beyond, town area, 1¾d. (1½d.), rural area 1¾d. (no change). Business two-part tariff: £15 per kW of lighting demand, plus a "unit" charge of ¾d. (against 1d. in the town area, and 1½d. in the rural area). Industrial contracts (town area only): First 100,000 kWh 1¾d. per kWh (1½d.); next 100,000 kWh 1¼d. (1½d.); beyond 1¼d. (1¼d.). Minimum charges have been abolished.

BARROW (town area).—Small power: From one hour after sunset until midnight, 7¾d. per kWh; from midnight until one hour after sunset—for the first 2,500 kWh per quarter, 1½d. per kWh; for next 10,000 kWh, 1¼d. per kWh; for next 12,500 kWh, 1d. per kWh; all energy over 25,000 kWh, ¾d. per kWh; charges in Dalton and the rural area are to be 5 per cent. above those in the town area.

SUTTON COLDFIELD.—Lighting flat rate: A reduction of ¼d. per kWh; reductions in other charges are also announced.

KIRKCALDY.—Lighting and motive power: Concessions involving a total reduction in revenue of £5,200.

BIRR (KING'S CO.).—Lighting: From 1s. to 10d. per kWh. Power: From 5d. to 4d. per kWh.

PORTSTEWART (CO. LONDONDERRY).—Lighting: From 10d. to 8d. per kWh. Power: From 6d. to 3d. per kWh. There will be a minimum charge of 10s. for each of the two summer quarters and 6s. 8d. for each of the two winter quarters.

Ripon.—SUPPLY TO RURAL AREAS.—At a recent meeting of the Corporation Electricity Committee, a letter was received from the Rural District Council stating that the residents of the parishes of Kirkby Malzeard, Laverton, &c., desired electricity, and inquiring the approximate date when a supply might be expected. The town clerk was authorised to put into operation a postal canvass of the areas concerned.

LIGHTING OF BATHS.—The Corporation Spa Committee has asked the city electrical engineer to prepare a scheme for the installation of electric lighting at the Spa baths.

South Shields.—ASSISTED WIRING.—The Corporation Electricity Committee has obtained sanction to the borrowing of £5,000 for the assisted wiring scheme.

Swansea.—ELECTRICITY SUPPLY AGREEMENT.—The Town Council has approved an agreement with the South Wales Power Distribution Co. for the supply of electricity to Gower and Pontardulais and the taking over of the Amman Valley line.

Torquay.—EXTENSIONS.—The Corporation Electricity Committee has approved a scheme for extending the electricity supply to Modbury at a cost of £6,442. A cable will serve the township and also form a link in the ring main as contemplated in a scheme already approved.

Tunbridge Wells.—LOANS.—The Town Council has applied for sanction to loans of £18,028 for mains and transformers, and £15,836 for the hire-purchase wiring scheme.

Watford.—EXTENSIONS.—The Corporation Electricity Committee is to apply for sanction to the provision of a turbo-alternator at a cost of £39,000, a water tube boiler (£17,900), switchgear and cables (£3,000), a coal conveyor (£600) and building extensions (£5,500).

Weymouth.—LOAN FOR METERS.—The Corporation Electricity Committee has obtained sanction to the borrowing of £3,000 for the purchase of meters.

Wick.—ELECTRICAL DEVELOPMENT.—The Town Council has decided to apply for sanction to the borrowing of £15,000 for the purpose of extending the power station and £450 for converting the street lamps from gas to electricity.

Traction

Aberdeen.—YEAR'S WORKING.—In his annual report Mr. James T. Gunn, general manager of the City Transport Department, states that for the year ended May 31st last the revenue from the tramway undertaking amounted to £162,314, which is a decrease of £5,323 compared with the previous year, while the working expenses at £130,894 show a decrease of £3,797. During the bad weather prevailing in the summer period revenue fell by over £3,000 in fourteen days, although the working expenses during that period were more or less similar to those of the previous year. The gross profit of £31,420 is £1,526 less than in the preceding year, and after setting aside £25,276 for interest, sinking fund, depreciation, &c., there remains a net profit of £6,144, which compares with £7,483 in 1929-30. During the year £29,006 was spent on capital account for the provision of electrical equipment, double-deck omnibuses, and sundry plant, making a total capital expenditure of £692,007. Passengers carried by the trams decreased from 42,968,027 to 41,700,576 and the car mileage from 2,892,538 to 2,858,639. The average revenue per car mile was 13.53d. as compared with 13.81d. in the preceding year.

Brazil.—RAILWAY ELECTRIFICATION.—The President has summoned a meeting of the heads of all railways serving the State of São Paulo to discuss the matter of electrifying the Central Railway. It is thought that a final decision will be reached before the end of this month, when tenders for the work will be invited. The agents of prospective bidders in the United States, Switzerland, Germany and France are already on the spot awaiting the distribution of specifications. It is believed that the successful tenderer might well be a British firm in view of two important factors—the high favour in which British electrification work is regarded in South America, and the tempting prices that the heavy discount in the pound sterling now renders possible for materials. Of the present length of the Central Railway (2,931 km.), it is proposed, as a first step, to electrify 64 km., forming the suburban district part of the system.—*Reuter's Trade Service* (Rio de Janeiro).

Continental.—DENMARK.—The Copenhagen Tramway Department is considering the substitution of omnibuses for its tramway service.

RUMANIA.—The Compagnie Italo-Belga, which is closely associated with the Banca Commerciale Italiana, is reported by a Milan newspaper to have received a concession for the electrification of the railway network in the four provinces of Transylvania.

Croydon.—YEAR'S WORKING.—Although the number of passengers carried increased from 20,605,564 to 20,866,896 the total revenue of the Corporation Tramways Department (manager: Mr. G. V. Stanley) for the past year showed a slight decrease, from £127,035 to £126,864. The car-mileage also fell from 2,312,360 to 2,292,134, the average revenue per car mile rising from 13.04d. to 13.06d. The total working expenditure amounted to £112,494, as compared with £111,442 in the preceding year, while there was a gross profit of £14,370 (£15,593). After providing for interest on loans (£19,026), contribution to sinking fund (£13,179), and in stalments of loans (£5,981), there was a net deficiency of £23,816, as against £24,327 in 1929-30.

Halifax. — RECONSTRUCTION OF TRAMWAYS. — The Town Council has received sanction to a loan of £88,897 for the reconstruction of portions of the tramways.

Ilford.—YEAR'S WORKING.—The report of the borough tramway manager and engineer, Mr. L. E. Harvey, on the working of the Tramway Department for the past year records a total revenue of £82,942 (including £2,273, rent for leased line at East Ham and £200 interest on bank balance), a working expenditure of £60,260, and a gross profit of £22,683. The figures for the preceding year were: Income, £82,244; working expenses, £58,010; gross profit, £24,234. There was a net profit of £4,999, as compared with £8,840 in the preceding year. Passengers carried increased from 16,395,883 to 16,679,879, and the car miles run from 1,128,303 to 1,153,429. The average revenue per car mile was 16.542d., as against 16.710d.

Japan.—NEW ELECTRIC RAILWAY.—Preliminary work is now being carried out for the construction of an electric railway, sixteen miles in length, between Furukawa and Iwai-machi. The new line, which is to be constructed by the Kwanto Electric Railway Co., Ltd., is to be completed by May, 1932, and will be extended about ten miles by the end of the same year.

Newport.—YEAR'S WORKING.—The revenue of the Corporation tramway undertaking (manager: Mr. A. Nichols Moore) for the past year amounted to £68,956, and compared with the previous year shows a decrease of £21,290, which is mainly attributable to the supersession of tramways by motor-'buses on the Chepstow Road route on August 18th, 1930, although there was a considerable falling off in traffic generally. Working expenses totalled £56,893, as against £65,865, while the gross profit fell from £24,381 to £12,063. There was a net deficiency of £1,835, as compared with a net surplus of £4,216 in 1929-30. The number of passengers carried totalled 10,795,667, a decrease of 3,352,067, while the car mileage amounted to 1,019,060, a decrease of 201,906. The revenue per car mile increased from 15.788d. to 16.240d.

New Zealand.—CHRISTCHURCH.—Christchurch has achieved the distinction of being the first city in New Zealand to have a fleet of trolley-buses. The Tramway Board has now seven such vehicles in use, six with N.Z.-built bodies on chassis imported from England, and one which is on loan from an English company.

RAILWAY ELECTRIFICATION.—The electrification of the Wellington-Paekakariki section of the line from Wellington to Palmerston North is now being carried out by the Government Railways Department.

Rhondda.—PROPOSED TRAMWAY ABANDONMENT.—At a special meeting of the Urban District Council held last week it was decided to take proceedings with a view to the replacement of the tramways by omnibuses. The matter was referred to the Legal and Parliamentary Committee to negotiate with the tramway company.

Telegraph and Telephone

Australia.—SHORT-WAVE RECEPTION.—The Postal Department has leased a large area of land from the Government of Victoria at Mont Park, and intends to establish an important short-wave receiving post as part of the experimental laboratory to be erected on the spot. The station will be used for the reception of the B.B.C. and other overseas programmes for rebroadcasting through the "A" class stations of Australia.

International Telephony.—ANGLO-ESTONIAN SERVICE.—The British Postmaster-General announces that telephone communication is now available between all parts of Great Britain and Northern Ireland and all parts of Estonia.

Italy.—VATICAN RADIO STATION.—It is reported that the Vatican City's private wireless station in Rome has been made available for public use. The charges will be the same as those made for ordinary telegrams.

Photo-telegraphy.—CONTINENTAL SERVICES.—A service of picture telegraphy has lately been established between Frankfort-on-Main and Munich in Germany and Rome in Italy. A similar service has also lately been made available between Copenhagen and Rome.

Ship-Shore Telephony.—SWANSEA SERVICE.—The Post Office has informed the local Chamber of Commerce that a ship-to-shore telephone system is to be inaugurated this week for the use of vessels in the King's Dock.

South Africa.—TELEPHONE TRUNK SYSTEM.—The long-distance telephone system between Cape Town, Johannesburg, Pretoria, and East London (a distance of 711 miles), was officially inaugurated last month, the ceremony at East London being conducted in the hall in which the annual congress of the Association of Chambers of Commerce was being held.

Radio

Czecho-Slovakia.—NEW STATION.—The new transmitter at Libice, near Prague, is expected to commence operating on October 28th. It will use a power of 120 kW and a wavelength of 486.2 metres.

India.—STATIONS FOR SALE.—The Viceroy's Executive Council, which aims at retrenchment, after considering the interests of firms selling radio equipment and holders of wireless licences, has endorsed the recommendation of the General Purposes Sub-Committee that the two broadcasting stations in Bombay and Calcutta should be closed down and the plant sold. The Government last year lost Rs.125,000 (£9,375) on its broadcasting service.

Reception.—TROLLEY-'BUS INTERFERENCE.—For the serious interference with reception that has been reported by listeners living along the line of route of the recently introduced trolley-'bus services of the London United Tramways, Ltd., in the Kingston area a cure has now been found. When the trouble was first reported, engineers of the General Post Office, in conjunction with representatives of the British Broadcasting Corporation and of the London United Tramways, undertook tests which resulted in the decision that experimental stopper coils should be manufactured and fitted to the trolley-'buses, between the trolley poles and the electrical gear, one in the lead to each trolley arm. Stringent tests with six trolley-'buses so equipped were carried out, each test being repeated on 'buses without the stopper coils in order that direct results of the coils could be assessed. The experiments proved successful and the tramway company has agreed, at its own expense, to fit stopper coils to the whole of the fleet of 60 trolley-'buses.

South Africa.—PRIVATE STATIONS.—Although the licence issued to a Cape Town music dealer to erect a transmitter over his premises has not been withdrawn, the Postmaster-General has suddenly changed his attitude towards private broadcasting. Business houses in various parts of the country lately applied for permission to erect stations of their own and were informed that the Government viewed the applications favourably, but they have now been notified, says *World-Radio*, that the Government thinks their requirements could probably be met by means of the existing service.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—December 1st. Post and Telegraph Department. Condensers. (A.X. 11111.)*
January 4th. Paper and varnished cambric insulated, lead covered, steel wire armoured cable. (A.X. 11127.)*

Barking.—October 27th. Electricity Department. Sub-station switchgear and two 250-kVA transformers. (See this issue.)

Cheadle and Gatley.—November 10th. Electricity Department. A 250-kVA transformer switch and distributor kiosk sub-station. (See this issue.)

Durham.—County Education Committee. Installation of electric lighting at the following schools:—Dean Bank, Croxdale, Tudhoe Colliery, Broom Cottages, Spennymoor North Road, Tudhoe Upper Church Street, Spennymoor Rosa Street, Barnard Castle, and Cockfield Council Schools. Particulars from Mr. F. Willey, architect, 34, Old Elvet, Durham.

Egypt.—CAIRO.—November 4th. Ministry of Public Works. Electric fans. (A.X. 11130.)*

Glasgow.—October 19th. Corporation. Electric lighting of houses at police stations. Specifications, etc., from the general manager, Electricity Department, 9, West Regent Street.

Horsham.—October 27th. Electricity Department. Rotary convertor equipment or alternatively mercury arc rectifier equipment. (October 9th.)

India.—NEW DELHI.—January 7th. Indian Stores Department. A.c. and d.c. ceiling fans. (A.X. 11116.)*
November 16th. Copper conductors. (G.X. 10826.)*

Manchester.—October 24th. Electricity Committee. Automatic voltage variation equipment and switchgear. (October 9th.)

New Zealand.—WELLINGTON.—December 18th. New Zealand Railways. Armoured cables and junction boxes. (A.X. 11122.)*
January 18th. Railway overhead equipment. (G.X. 10792.)*
February 29th. Three automatic railway sub-stations. (A.X. 11105.)*
November 21st. Post and Telegraph Department. Dial cords. (A. 11121.)*
December 8th. 2,000 carbon diaphragms. (A.11131.)*
December 8th. 200 head receivers. (A. 11133.)*
November 24th. 500 telephone mouthpieces. (A.X. 11115.)*
November 26th. Connection strips. (A. 11120.)*
November 30th. Moulded telephone cases. (A. 11119.)*
December 15th. Public Works Department. 50-kV oil-immersed circuit breakers for Arapuni. (A.X. 11118.)*
CHRISTCHURCH.—November 12th. City Council. Pump, motor and control gear for Mays Road pumping sub-station. (G.X. 10774.)*

Northern Ireland.—November 16th. Electricity Board. 3½ miles of 132-kV and 33-kV four-circuit overhead transmission line. (October 9th.)

Rumania.—BUCHAREST.—November 2nd. Municipal Waterworks. Electric motors and pumps for waterworks at Grosavesti. (G.X.10822.)*

South Africa.—BENONI.—November 9th. Municipal Council. Electrically operated automatic traffic control signals.
DURBAN.—October 28th. Corporation. Transformers. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Town Council. Accepted:—
Eleven transformers (£367).—General Electric Co., Ltd.
Reconditioning eighteen electric cookers (£137).—British Electric Transformer Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
Cables (£340).—Derby Cables, Ltd.

Croydon.—Electricity Committee. Recommended:—
Kiosk with switchgear (£320).—Metropolitan-Vickers Electrical Co., Ltd.
Switchgear (£187).—A. Reyrolle & Co., Ltd.

Gravesend.—Electricity Committee. Recommended:—
Feed pump (£222).—Holden & Brooke, Ltd.
Recorder (£170).—Lea Recorder Co.

Lamp Contract.—The Edison Swan Electric Co., Ltd., has received an order from the Seaham Harbour Electricity Department for the supply of electric lamps for six months.

Liverpool.—Port Sanitary and Hospitals Committee. Accepted:—
Electrical heating of fifteen cottages at Olive Mount (£284).—Western Engineering Co.
City Council. Accepted:—
Refitting the existing battery at the Lister Drive power station (£2,222).—Tudor Accumulator Co., Ltd.

London.—ST. MARYLEBONE.—Electric Supply Committee. Recommended:—
Transformers for 12 months ending October 15th, 1932.—British Electric Transformer Co., Ltd.
Switchgear for transformer sub-stations during the year ending October 15th, 1932.—Ferguson, Pailin, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.

Manchester.—Electricity Committee. Accepted:—
Prepayment meters.—Measurement, Ltd.; Smith Meters, Ltd.; Ferranti, Ltd.
6,600-V switchgear (annual contract).—Ferguson, Pailin, Ltd.
6,600-V cellular-type switchgear (High Street sub-station).—British Thomson-Houston Co., Ltd.
Non-automatic, induction type, voltage regulator for 8,500-kVA transformer.—English Electric Co., Ltd.
Automatic voltage regulating equipment for 3,000-kVA transformer.—Fuller Electrical and Manufacturing Co., Ltd.
Extensions to supervisory control equipment (West Didsbury and Denton (West) sub-stations).—Metropolitan-Vickers Electrical Co., Ltd.
Weldless steel tubes.—British Mannesmann Tube Co., Ltd.; Stewarts & Lloyds, Ltd.

Plymouth.—Electricity Committee. Accepted:—
Switchgear (£7,964).—A. Reyrolle & Co., Ltd.
Circuit-breaker feeder units for new sub-stations (£763).—J. G. Statter & Co.
Health Committee. Accepted:—
Electrical apparatus for city hospital.—218 vapour radiators (£1,571); thermostatic gear for controlling radiators (£657); ten electrically-heated storage cylinders (£1,102); boiler (Bonecourt) and all auxiliaries (£565); sterilising plant for operating block (£216); roasting ovens, frier, toaster and griller (£300).—Benham & Sons, Ltd.

Portsmouth.—Electricity Committee. Accepted:—
Cables.—Hackbridge Cable Co., Ltd.: Johnson & Phillips, Ltd.; Edison Swan Cables, Ltd.; British Insulated Cables, Ltd.; Metropolitan Electric Cable & Construction Co., Ltd.; General Cable Manufacturing Co., Ltd.

South Shields.—Watch Committee. Accepted:—
Electric lighting installation at fire station (£162).—Gabriel Bompertz.

Surbiton.—Mefropolitan Water Board. Recommended:—
Electric generator switchboard for pumping station (£770).—Standard Switchgear, Ltd.
The recommended tender was the lowest of twenty-six received, the highest being £1,595.

Westhampnett.—Rural District Council. Accepted:—
Installation of electric lighting at the isolation hospital (£100).—Robotham & Pinnock.

Forthcoming Events

British Electrical Development Association.—Friday, October 16th. Royal Society of Arts, London. 7.30 p.m. "Light Therapy with particular reference to Ultra-violet Irradiation." Dr. W. Beaumont.

Overhead Lines Association.—Friday, October 16th. Georgian Restaurant, Harrods Stores, W. 8 p.m. Third annual conversazione.

Association of Supervising Electrical Engineers.—Saturday, October 17th. Lysbeth Hall, Soho Square, W. Dinner, whist drive and dance. Tuesday, October 20th. Junior Institution of Engineers, London. 7.15 p.m. Presidential address. Mr. G. Scott Ram.

Association of Mining Electrical Engineers. — Saturday, October 17th. South Wales Institute of Engineers, Cardiff. 6 p.m. Chairman's address. Major W. Roberts.

Institute of Fuel.—Tuesday, October 20th. Institution of Mechanical Engineers, London. 6 p.m. Presidential address. Sir Hugo Hirst, Bart. Wednesday, October 21st. Connaught Rooms, Great Queen Street, W.C. 6.45 for 7.15 p.m. Annual dinner and dance.

Electrical Power Engineers' Association (Manchester Technical Group).—Wednesday, October 21st. St. Mary's Parsonage, Deansgate, Manchester. 7.15 p.m. "Some Commercial and Economic Aspects of the Operations of the Central Electricity Board." Mr. J. Eccles.

Batti-Wallahs' Society.—Thursday, October 22nd Hotel Metropole, London. 12.30 for 1 p.m. Luncheon. "India," by Lord Meston.

Institution of Electrical Engineers.—October 22nd. 6 p.m. London, Presidential address. Capt. J. M. Donaldson. (*Mersey and North Wales (Liverpool) Centre.*)—Monday, October 19th. Laboratory of Applied Electricity, University, Liverpool. 7 p.m. Chairman's address. "The Application of Electricity to the Measurement of Temperature." Mr. P. M. Hogg. (*Scottish Centre.*)—Tuesday, October 20th. Glasgow. 7.30 p.m. Chairman's address. Prof. G. W. O. Howe. (*North-Eastern Students' Section.*)—Friday, October 16th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Chairman's address. Mr. E. N. Cunliffe. (*South Midland Students' Section.*)—Tuesday, October 20th. Grand Hotel, Birmingham. 7 p.m. Chairman's address. Mr. S. C. Dinenage. (*North-Western Centre.*)—Tuesday, October 20th. Midland Hotel, Manchester. 7.30 p.m. Chairman's address. Mr. L. Romers. (*Sheffield Sub-Centre.*)—Wednesday, October 21st. Royal Victoria Hotel, Sheffield. 7.30 p.m. Chairman's address. Mr. I. Scott Mackenzie.

Junior Institution of Engineers.—Friday, October 23rd. Institution, London. 7.30 p.m. Informal meeting. "Some Instruments Used in Connection with Power Plant (with special reference to water and flue gases)." Mr. I. Fagelston.

Birmingham Electric Club.—Friday, October 23rd. Grand Hotel, Birmingham. 7 p.m. "A Discussion on a.c. Motor Performance and Application." Mr. E. W. Walker.

Faraday House Old Students' Association.—Friday, October 23rd. Savoy Hotel, W.C. Annual dinner.

Electrical Association for Women.—Wednesday, October 21st. Institution of Electrical Engineers, London. 5 p.m. Conference to discuss the training of women demonstrators.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following :—

DUROS reflector.
DAVON dry battery for medical purposes.
WINHAY leakage protective device.
ENTWISTLE-JONES leakage protective device.

Notes

Technical Nomenclature

At the recent centenary meeting of the British Association for the Advancement of Science, Professor G. W. Osborne Howe presented an interim report of the Committee on Electrical Terms and Definitions. It showed that during the past year six members of the Committee had written and circulated theses dealing with different aspects of the subject. Differences of opinion were being considered in many other countries, but all were finding it hard to arrive at an agreed system of definition, largely due to the different methods by which the subject was approached by physicists and electrical engineers. The Committee was re-appointed, with the addition of Sir Richard Glazebrook, Dr. W. E. Sumpner, and Dr. D. W. Dye. A discussion ensued in which Sir James B. Henderson, Professor Fortescue, Professor Cramp, and Sir Alfred Ewing took part, while Professor A. E. Kennelly briefly surveyed the work done by various committees throughout the world.

Floodlighting Assists a Fire Brigade

At a disastrous fire which occurred in Wellington Street, Leeds, recently, the fire brigade was given valuable assistance by the local branch of the Edison Swan Electric Co., Ltd.

The building involved in the conflagration was that of a paint and wallpaper manufacturers, and, due to the nature of the material stored in the building, the light usually supplied by the flames was counteracted by dense clouds of smoke which hampered the firemen, who found considerable difficulty in locating windows through which to direct their hoses. At this juncture, a number of powerful floodlights, hastily placed in position by the Edison Swan Co., Ltd., on their premises immediately opposite, were trained on the burning building—an impromptu effort which gave the brigade valuable assistance.

Appointments Vacant

Superintendent of telephones for the Government of St. Vincent.

Assistant town engineer for San Fernando, Trinidad.

(See our advertisement pages to-day.)

German Electrical Standards

With the object of inducing electrical engineers in overseas countries to order material made in accordance with German standards, the Union of German Electrical Engineers (V.D.E.) has recently issued English, French, Spanish, and Portuguese translations of the V.D.E. standards for (1) the classification and testing of electrical machines, (2) the classification and testing of transformers, (3) sheathed conductors, (4) insulated conductors for heavy-current installations, and (5) lead-covered cables for power plant.

World Electric Power Production

The Belgian electricity undertaking financing concern "Sofina Electrobel" has compiled the following table of the estimated output of electric power in the leading countries of the world during the past three years :—

Country.	1928. Millions kWh.	1929. Millions kWh.	1930. Millions kWh.
United States	104,927	114,421	111,305
Germany	27,871	30,660	29,403
Canada	16,338	17,639	17,856
Great Britain..	13,828	14,395	16,227
Italy	9,771	10,557	10,757
Switzerland	5,304	5,398	5,562
Belgium	3,622	4,034	4,100

It will be seen that, as compared with 1929, the industrial depression resulted in a reduced output during last year in both the United States and Germany and a slackening off in some of the other countries, although Great Britain recorded a substantial increase.

Power in Paper Mills

In a paper read at the Twenty-second General Conference of the Paper Makers' Association of Great Britain and Ireland, Mr. Edward Burns deals with what were at one time considered "Absurd Ideas and the Balance Sheet." In the course of his remarks he points out that the use of high-pressure steam-turbines, with their oil-free condensate, has brought within range the possibility of obtaining a complete balance between the power required for driving paper mills and the production of the requisite quantity of process steam. He advocates the use of steam at 1,000 lb. per sq. in. pressure, which would give far better results than those obtained with a working pressure of 350 lb. per sq. in., which has given returns considered quite satisfactory hitherto.

Generation of Electricity in September

The official returns rendered to the Electricity Commissioners show that 875 million kWh was generated by authorised undertakers in Great Britain during the month of September, 1931, as compared with the finally revised figure of 834 million kWh in the corresponding month of 1930, or an increase of 4.9 per cent. During the first nine months of 1931 up to the end of September, the total amount of electricity generated by authorised undertakers was 8,048 million kWh, as compared with the finally revised figure of 7,762 million kWh for the corresponding period of 1930, representing an increase of 3.6 per cent.

Swan Memorial in Newcastle

It was announced in the ELECTRICAL REVIEW of June 5th that the Newcastle-upon-Tyne Electric Supply Co., Ltd., intended to erect a tablet on the outer wall of its head office at Carliol House to perpetuate the memory of the late Sir Joseph Swan, D.Sc., F.R.S. This tablet, which has now been put up, is very similar to that recently unveiled in Sunderland—the town of Sir Joseph's birth. It is cast in bronze and depicts, in relief, a side view of the head and shoulders of Sir Joseph. Underneath is an inscription which reads as follows :—

"Sir Joseph Wilson Swan, D.Sc., F.R.S., Inventor of the electric incandescent lamp and a pioneer in the science of photography.

"He was born in Sunderland, 31st October, 1828, and died 27th March, 1914.

"This Tablet was erected by the Newcastle-upon-Tyne Electric Supply Company, Limited, in recognition of the great services which Sir Joseph rendered to the Electrical Industry.

"Fiat Lux."

Apart from his invention of the electric lamp, Sir Joseph carried out pioneer work in regard to electric storage batteries, practical photography, and the manufacture of artificial silk.

We desire to remind our readers that a special committee, consisting of representatives of the borough of Sunderland and members of the Institution of Electrical Engineers, are now making an appeal for £5,000 for a Swan National Memorial, which is to take the form of scholarships for the promotion of electrical engineering science. Of this sum, about £2,800 has already been subscribed; it is hoped to realise the full amount at an early date, and contributions should be sent to Mr. E. T. Nicholson, Martins Bank, Ltd., Fawcett Street, Sunderland, or to Mr. P. F. Rowell, Secretary, The Institution of Electrical Engineers, Victoria Embankment, W.C.2.

"Pernax" Insulation

"Pernax" insulating material is made by mixing pure para rubber as a base with vegetable waxes to form a homogeneous dielectric, which is waterproof, comparatively acid-proof and impervious to chemical fumes, and relatively immune from the effects of ozone. It is not vulcanised, and neither sulphur nor any other material injurious to copper and steel is contained in it, so that conductors need not be tinned. It is applied under pressure direct by means of dies, and the ease with which it can be moulded facilitates jointing and repairs.

"Pernax" wires and cables have been made by the Croydon Cable Works, Ltd., for many years in accordance with the B.E.S.A. specification of 1926, and its numerous other applications also include its use as a protective sheathing for the live parts of high-voltage outdoor sub-stations under the severest weather conditions. Some of the simple ways in which it can be used as a protective agent, demonstrated last week, are as guards for joints between bus-bars, flexible connections, transformer terminals and tee-offs, sealing-end tops, spring contacts of potential transformers and conductor sockets; for insulating the primaries of small transformers and the live rails of electric railways, for supporting overhead lines without porcelain insulators, as bird guards for the latter, and for shielding them from salt-spray deposits and the excreta of insects.

The exhibits also included solid and split tubing, tape, sheet, rods, samples of sheathing for protecting underground cables and pipes against electrolysis and corrosion, various types of wires, and "Pernax"-insulated cables with P.B.J. finish for overhead-lines. The use of this material as a preventive of surface conductance and for sheathing sub-station parts and switchgear should no doubt be considerably extended when its possibilities are more generally realised, for it can be moulded quite easily in hot water, and its flexibility obviates the danger of fracture when applied to parts liable to movement and vibration; its dielectric strength is about 1,000 volts per one-thousandth of an inch, but it is not suitable for situations in which the temperature is likely to exceed 200 deg. F.

The company also demonstrated its new duct traverser, an interesting device which consists of a compressible spring between two non-retractable travelling ends. It will traverse any size or length of duct and can be provided with a releasing attachment to permit it to be withdrawn should it encounter an impassable obstacle. An irregularly laid line of 4-in. ducts, 200 yards in length, has been traversed in 20 minutes, with one man only operating for the whole length, by alternately pulling and releasing a wire rope attached to the traverser. As a substitute for drain rods, the new device seems to be rapid, cheap, and convenient.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

On Thursday next the Institution of Electrical Engineers holds its first meeting of the 1931-1932 session, when the presidential address will be delivered by Captain J. M. Donaldson, M.C. We are therefore publishing on page 563 of this issue portraits of the President and of the chairmen of the Wireless Section, the Meter Section, and of the various local centres.

Captain J. M. Donaldson

We gave a full account of the career and activities of the new president in THE ELECTRICAL REVIEW for June 5th, and all that we need add now is that he is the popular chief engineer to the North Metropolitan Electric Power Supply Co. We wish him and the Institution over which he presides a very successful session.

Col. A. S. Angwin

The new chairman of the Wireless Section, Col. A. S. Angwin, is, of course, a Post Office man. He graduated as B.Sc. (Engineering) at London University from East London College, and obtained a Whitworth Exhibition in 1902. He was apprenticed to Messrs. Yarrow & Co., entering the Post Office service as an engineer in 1906. He had considerable experience in telephone and telegraph plant and equipment, construction and maintenance up to the War period. During the War he commanded the 52nd (Lowland) Divisional Signal Company and served in Gallipoli, Egypt, Palestine, and France. He was awarded the M.C. and the D.S.O., and in 1927 was awarded the T.D. He has been engaged in the Engineer-in-Chief's Department, Post Office, Wireless Section, since the War, and has been staff engineer-in-charge since June, 1928. The principal wireless works on which he has been engaged have been Leafield, Cairo and Rugby wireless stations. He was also associated with the beam stations which were constructed by the Marconi Co. for the Post Office, and has been engaged in the development of transatlantic telephony to the U.S.A. and extensions to Australia, Canada, South America, etc. He is now the Post Office representative on the Radio Research Board.

Mr. F. C. Knowles

Mr. Knowles, who is the chairman of the Meter and Instrument Section, obtained a scholarship at the East London College, and subsequently specialised in electrical testing at the University College, London. His early electrical experience was obtained at the North Woolwich works of Messrs. W. T. Henley's Telegraph Works Co., Ltd., and at the works of Foxcroft & Duncan, Dalston, who were the successors to Paterson & Cooper, Ltd. In 1900 he entered the service of Evershed & Vignoles, Ltd., and in 1911 he was appointed technical assistant to the managing director, Mr. E. B. Vignoles. During the War he was retained in connection with various confidential systems of electrical control on warships invented and manufactured by Evershed & Vignoles, Ltd., and other apparatus to meet the national emergency. In 1923 he was appointed to his present post of sales manager of the company. Mr. Knowles is a member of various technical societies, and is a well-known lecturer on electrical testing.

Col. H. E. O'Brien

Colonel O'Brien, D.S.O. (chairman of the Irish Centre), received his education at Eton and at the Engineering School of Leeds University. He received his practical training with Kitson & Co., Leeds, the Dublin and South Eastern Railway, and subsequently as a pupil of Sir John A. F. Aspinall at the Horwich locomotive works of the L. & Y. Railway. His first appointment was that of resident electrical engineer on the first suburban electrification in Great Britain between Liverpool and Southport and was in sole charge of this from its inception in 1903 till 1909. In 1909 he became carriage and wagon superintendent of the L. & Y. Railway, and in 1910 was appointed deputy chief mechanical engineer. During the War he served in France and also held important positions under the Ministry of Munitions. While he was in France he was awarded the D.S.O. for his services. On the amalgamation of the L. & Y. Railway Co. and L. & N.W. Railway Co. in 1922 he was appointed electrical engineer to the new company, and in January, 1923, he became electrical engineer to the L.M. & S. Railway Co. He resigned this appointment in March, 1925. Colonel O'Brien is the author of a number of papers on electric traction.

Mr. R. G. Ward

Mr. Ward, who is chairman of the North Midland Centre, was educated at Towcester School and received his early electrical training in the same town. For several years he served in the electrical department of the Dowlais Steel & Iron Works, and in 1899 left there to join Messrs. John Brown & Co., Ltd., with which company he has since been associated. He was chairman of the Sheffield Sub-Centre of the I.E.E. during the 1928-29 session and represented the Institution at the Royal Sanitary Congress which was held in Sheffield in 1929. For two years he was a member of the North Midland Centre Committee of the Institution, during the latter of which he was vice-chairman. He was also president of the Sheffield and District Engineering and Steel Trades' Council for the year 1930.

Mr. A. G. Shearer

Mr. Shearer (chairman of the North-Eastern Centre) served his apprenticeship with the Sunderland Forge & Engineering Co., and the latter part of his training was spent in the power station of the Sunderland Corporation. He joined the Newcastle-upon-Tyne Electric Supply Co., Ltd., as a junior assistant engineer in November, 1901, and in the following year went to the Cork Electric Tramways and Lighting Co. as a shift engineer. In 1903 he was appointed chief assistant engineer of the Reading Corporation tramways, where he remained until October, 1906, when he returned to the Newcastle-upon-Tyne Electric Supply Co. as a control engineer, and the following year was appointed electrical superintendent of the company's northern area. Mr. Shearer joined the I.E.E. as a student in February, 1900.

Mr. N. B. Rosher

Mr. Rosher has been elected chairman of the South Midland Centre for the second time, having occupied that position in 1921, when he resigned before the commencement of the session for private reasons. He received his education at Repton School and King's College, London. He served as pupil for three years with the Electric Construction Co., Ltd., and with Messrs. Drake & Gorham, Ltd. Later he went to Messrs. Siemens Bros. & Co., Ltd., first on their outside staff and later as resident engineer for the building and equipment of their dynamo works at Stafford. In 1904 he became a senior assistant on the staff of Messrs. Preece & Cardew, and was appointed by them as resident engineer to carry through the electrification of H.M. Dockyards at Chatham and Simon's Bay, South Africa. In 1908 Mr. Rosher set up in partnership with Mr. F. J. Moffatt as consulting engineers in Birmingham, and during the next thirteen years he was engaged on schemes chiefly in connection with the electrification of factories. On the outbreak of the War he joined the staff of the Ministry of Munitions, and in recognition of this service he received the O.B.E. In 1921 he was appointed chief engineer to the screw section of Messrs. Guest, Keen & Nettlefolds, Ltd., and a year later was, in addition, appointed general manager of the various works in the screw section, which appointments he now holds.

Mr. P. M. Hogg

Mr. Hogg (chairman of the Mersey and North Wales (Liverpool) Centre) served his apprenticeship with Messrs. Glenfield & Kennedy and graduated at Glasgow University, after which he entered the generating department of the Glasgow Corporation Electricity Department. In 1912 he left Glasgow to become electrical engineer at one of the works of Messrs. Pilkington Bros., Ltd., glass manufacturers. Two years later he was appointed chief electrical engineer to that company. Mr. Hogg is delivering his address to the Centre on Monday next. His subject is "The Application of Electricity to the Measurement of Temperature."

Mr. J. Wayne-Morgan

Mr. Wayne-Morgan (chairman of the Western Centre) was educated at Clifton College, and afterwards went to the works of the Uskside Engineering Co., Newport, Mon., and Messrs. Thomas Parker, of Wolverhampton. For twelve months he was at the Central Technical College, Kensington. In 1905 he commenced business on his own account as consulting engineer, and, except for the war period, 1914-19, has been in practice ever since. During the War he served in R.E. field companies in France, retiring with the rank of major, and in 1916 he was awarded the Military Cross.

Mr. L. Romero

Mr. Romero (chairman of the North-Western Centre) received his electrical training at Faraday House, where he graduated as prizeman, and with Messrs. Belliss & Morcom, Birmingham, and at the Salford Corporation electricity works. On completion of his apprenticeship at Salford, he was put in charge of the testing department. Later he was transferred to the mains department, was appointed mains engineer in 1911, and city electrical engineer in 1927. In collaboration with Mr. J. B. Palmer, in 1922, he wrote a paper on "The Interconnection of a.c. Power Stations" for the I.E.E.

Prof. G. W. O. Howe

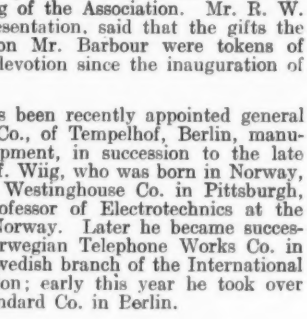
The chairman of the Scottish Centre is Prof. Howe, who was apprenticed at the Woolwich works of Messrs. Siemens Bros. In 1897 he obtained a Whitworth Exhibition and London Senior County scholarship, and in 1900, at Armstrong College, Newcastle-on-Tyne, he graduated as D.Sc. with honours in engineering and physics. In the same year he gained first place in the Whitworth Scholarship examination. He spent two years with the Siemens-Schuckert Co., of Berlin, and a year with Siemens Bros., Woolwich. In September, 1903, he was appointed lecturer in electrical engineering at

Hull Municipal Technical College. In 1905 he went to the City and Guilds Engineering College, where he was associated with Professors Ayrton and Mather, and became assistant professor of electrical engineering. In January, 1921, he was appointed head of the Department of Electrical Standards and Measurements at the N.P.L., but in October of the same year he was appointed to the newly established James Watt Chair of Electrical Engineering at Glasgow University. He was awarded the D.Sc. of Durham University in 1914, and in the same year the University of Adelaide conferred upon him the honorary degree of D.Sc. He is a past chairman of the Wireless Section of the I.E.E., and his many activities include membership of the Radio Research Board. From 1914 to 1923 he was secretary of the Engineering Section of the British Association, and president of the Section at the Toronto meeting in 1924. He is chairman of the Joint Committee for National Certificates and Diplomas in Electrical Engineering (Scotland), a member of Committees of the B.E.S.A. and of the Electrical Research Association, and he is also a director of the Mullard Radio Valve Co.

Mr. J. M. Barbour, hon. secretary of the Paisley Association of Electrical Engineers, was presented with a tea trolley and log box at a recent meeting of the Association. Mr. R. W. Dodson, who made the presentation, said that the gifts the members were bestowing on Mr. Barbour were tokens of regard for his loyalty and devotion since the inauguration of the Association in 1919.

Prof. Jens Bache-Wiig has been recently appointed general director of the C. Lorenz Co., of Tempelhof, Berlin, manufacturers of telephone equipment, in succession to the late Herr E. O. Zwietusch. Prof. Wiig, who was born in Norway, was for a period with the Westinghouse Co. in Pittsburgh, U.S.A., and afterwards Professor of Electrotechnics at the University at Drontheim, Norway. Later he became successively a director of the Norwegian Telephone Works Co. in Oslo, and manager of the Swedish branch of the International Standard Electric Corporation; early this year he took over the management of the Standard Co. in Berlin.

Professor C. A. Middleton Smith, M.Sc., M.I.Mech.E., whose article on "Engineering Trade in China" which appeared in our last issue, has attracted considerable attention, is at present in England. He came home as a delegate to the Faraday Centenary celebrations and returns to Hong Kong in November to resume his duties at the University where he is Professor of Engineering. Professor Middleton Smith has long been a very keen student of the commercial as well as the technical sides of British engineering, and his interest in stimulating our export activities in the Far East is well known to manufacturers and traders here by reason of his many spirited contributions to our own and other journals and his discussions with representative organisations from time to time.



[North End Studio, Portsmouth.

Prof. C. A. Middleton Smith, of Hong Kong University

The Royal Commission on Awards to Inventors in its sixth report has awarded **Mr. A. E. Frankling** and **Mr. W. H. Harris** £5,000 for an improved method of leading cables into gun turrets. **Mr. S. G. Brown** receives £5,000 for liquid level control in gyro compasses. It is reported that Mr. Brown, as on previous occasions, has declined to accept the award.

Mr. S. Wildman, of the Publicity Department of Philips Lamps, Ltd., has resigned his position, and **Mr. Harold M. Porter,** who has been for some years manager of the Purchasing Department, has been appointed manager of the Publicity Department.

Mr. W. Badham, formerly an assistant in the test room of the Cardiff Corporation Electricity Department, has taken up duties with the Sidmouth Electricity Supply Co. as assistant to the resident engineer, Mr. P. C. Tracey.

Mr. F. Ridout has been appointed by the General Electric Co., Ltd., to succeed the late Mr. F. Crawford as manager of the Liverpool branch of the company. The company has also appointed **Mr. J. Williams,** formerly of Cardiff, as manager of its new branch at Gloucester.

Mr. T. S. Smith, of the Technical Department at the North Woolwich works of W. T. Henley's Telegraph Works Co., Ltd., has gained an L.C.C. senior scholarship for science. Mr. Smith has left the company's service and has commenced his course at King's College.

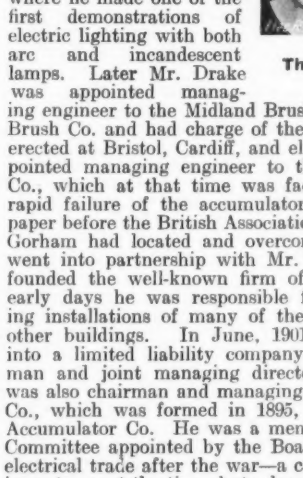
Obituary

Mr. Bernard Drake. As briefly recorded in our last issue, Mr. Bernard Mervyn Drake passed away suddenly on October 5th at his Scottish estate. Mr. Drake, who was the eldest son of Major-General Drake, C.B., R.E., was born at Malta in May, 1858, and was therefore 73 years of age. In our leaderette pages last week we alluded briefly to Mr. Drake's lengthy and very close and active connection with various branches of the electrical industry. We are now able to refer to some of the outstanding interests and events which have combined to make up his career and to publish an admirable photograph which represents a quite typical attitude. He was educated at Rossall and spent four years in the works of Sir Joseph Whitworth at Manchester. In 1881 he entered the service of the Brush Co. and was sent by them to Madrid, where he made one of the first demonstrations of electric lighting with both arc and incandescent lamps. Later Mr. Drake was appointed managing engineer to the Midland Brush Co. and the Great Western Brush Co. and had charge of the early central supply stations erected at Bristol, Cardiff, and elsewhere. In 1884 he was appointed managing engineer to the Electrical Power Storage Co., which at that time was faced with serious loss due to rapid failure of the accumulator plates. In 1886 he read a paper before the British Association describing how he and Mr. Gorham had located and overcome the trouble. In 1886 he went into partnership with Mr. John Marshall Gorham and founded the well-known firm of Drake & Gorham. In the early days he was responsible for the design of the lighting installations of many of the largest country houses and other buildings. In June, 1901, the firm was converted into a limited liability company and Mr. Drake was chairman and joint managing director with Mr. Gorham. He was also chairman and managing director of the D.P. Battery Co., which was formed in 1895, and chairman of the Tudor Accumulator Co. He was a member of the Electrical Trades Committee appointed by the Board of Trade to report on the electrical trade after the war—a committee which was of great importance at the time, but whose work, we fear, is practically forgotten to-day. For twenty-five years Mr. Drake was consulting engineer to the Bank of England and was responsible for the installation of the original generating plant.

The late Mr. Bernard Drake

Mr. E. Carpmael.—The death occurred on October 6th, at West Norwood, of Mr. Edward Carpmael, a past-president of the Institute of Chartered Patent Agents, at the age of 83.

Sir John Monash.—We regret to record the death of General Sir John Monash, which occurred on October 8th at Melbourne. Of Sir John's wonderful influence in inspiring the Australian forces in the Great War, and as a great Australian—fascinating as the theme would be to dwell upon—need not be reviewed here. He is brought within the scope of this journal by reason of the prominent office that he held from the year 1920 onwards as Chairman of the State Electricity Commission of Victoria. The accompanying portrait is from a photograph received from him three years ago, when, as Chairman of the Commission, he contributed to our Annual Domestic Issue (October 19th, 1928, p. 651) a valuable review of "Electrical Advance in Australia: The Example of Victoria." Sir John was born in Melbourne in June, 1865, and was therefore 66 years of age. Early in his career he carried off engineering honours, and began practice as a civil engineer in 1884. Many papers on engineering matters were read by him before Australian societies and institutions, and he was President of the Australian Association for the Advancement of Science in 1924-26.



[Lafayette, Melbourne.

The late Sir John Monash

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Mid-Lincolnshire Electric Supply Co.—Public company. Registered October 5th. Nominal capital £1,000 in £1 shares. Objects: To adopt an agreement between R. B. Matthews of the one part and British & International Utilities, Ltd., of the other part, to acquire the Mid-Lincolnshire Electricity Special Order, 1930, and any Order made in extension thereof, to act as undertakers for the supply of electricity for lighting, heating, and other purposes in the counties of Lincoln, Leicester, Rutland, and Northampton or elsewhere. The subscribers are:—J. Wynne, 37, Ingram Road, Thornton Heath, Surrey; C. R. Webb, 25, Ethelburga Street, Battersea, S.W.11; and five others. Solicitors: Stephenson, Harwood & Tatham, 16, Old Broad Street, E.C.2.

Diamond Lamp Shade Co., Ltd.—Private company. Registered October 5th. Capital £1,000 in £1 shares. Objects: To acquire the business of a lamp shade manufacturer carried on by J. P. McAuliffe at 8, Green Street, Manchester, as the "Diamond Lamp Shade Company," and to carry on the same and the business of manufacturers, wholesalers and retailers of lamp stands, holders and other accessories used in connection with artificial lighting, electricians, etc. The first directors are:—J. P. McAuliffe, 8, Green Street, Manchester, and H. P. Southward, Heath Villa, Longley Lane, Northenden, Manchester. Registered office: 8, Green Street, Manchester.

Bognor Regis Rediffusion Service, Ltd.—Private company. Registered October 7th. Capital £5,000 in 4,500 8 per cent. cumulative preference and 500 ordinary shares of £1 each. Objects: To adopt an agreement with the Urban District Council of Bognor Regis and J. F. Powell, and to establish, maintain, and develop a service for the relaying of radio programmes to subscribers and others in Bognor Regis and elsewhere. The subscribers are:—L. E. B. Everett, Old Point Cottage, Middleton, Bognor Regis; and C. Whitcroft, "Inglewood," New Wanstead, Wanstead, Essex. The first directors are to be appointed by the subscribers. Solicitors: Farrar, Porter & Co., 2, Wardrobe Place, E.C.4.

Bacup Radio Relay Co., Ltd.—Private company. Registered October 6th. Capital £600 in £1 shares. Objects: To carry on the business of wireless, electrical and mechanical engineers and contractors, etc. The directors are:—J. J. Holden, 25, St. James' Street, Bacup; J. Crawshaw, 1, Fowler Street, Bacup; A. Shaw, "Windyridge," Weir, Bacup; and W. L. Ball, 665, Burnley Road, Crawshawbooth, Rawtenstall.

Morris Relay Services, Ltd.—Private company. Registered October 7th. Capital £1,000 in £1 shares. Objects: To carry on the business of the relaying and general rediffusion of wireless programmes, etc. The subscribers are:—F. J. Morris and F. G. Morris, both of 4, Lincoln Road, Portslade-by-Sea. F. G. Morris signs documents as director. Registered office: 28, Boundary Road, Hove.

Surrey Radio Service Co., Ltd.—Private company. Registered October 8th. Capital £1,000 in £1 shares (500 7½ per cent. non-cumulative preference and 500 ordinary). Objects: To carry on the business of manufacturers of and dealers in loud speakers, gramophones, wireless sets, radio-gramophones, etc. The subscribers are:—W. H. Scott and W. P. Madgin, both of 108, Victoria Street, S.W.1. The first directors are not named. Registered office: 103, Victoria Street, Westminster, S.W.1.

British Steinite Radio, Ltd.—Private company. Registered October 8th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers, merchants, importers and exporters of radio sets, components and accessories, electrical goods, gramophones, etc. The subscribers are:—J. Lewin, 118/122, Great Portland Street, W.1; and B. Greenwood, 77, Tyndale Mansions, Islington, N.1. The first directors are to be appointed by the subscribers. Secretary: J. Lewin.

Barrons Radio Supplies, Ltd.—Private company. Registered October 8th. Capital £250 in £1 shares. Objects: To carry on the business of radio consultants, service agents, etc. The permanent directors are:—C. Bernstein (chairman) and Mrs. Amy Bernstein, both of 39, Mere Road, Blackpool. Solicitor: J. A. F. Callis, Midland Bank Chambers, Church Street, Blackpool.

Guaranteed Electrical Rewinds, Ltd.—Private company. Registered October 1st. Capital £1,000 in £1 shares. Objects: To carry on the business of rewinders of electric motors, magnetos, dynamos, magnets and other electrical plant, machinery and apparatus, etc. The subscribers are:—C. A. Elliott and A. Slater, both of 39, Bank Street, Sheffield. Solicitors: Slater and Elliott, 39, Bank Street, Sheffield.

M. Lichtenberg, Ltd.—Private company. Registered October 5th. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in all kinds of wireless apparatus, etc. The subscribers are:—M. Lichtenberg and Mrs. P. Lichtenberg, both of 19, Heathfield Gardens, N.W.11. Solicitors: Woolfe & Woolfe, 13a, Old Burlington Street, W.1.

E. Hammond & Co. (Auto-Electric), Ltd.—Private company. Registered October 1st. Capital £1,600 in £1 shares. Objects: To carry on the business of magneto, dynamo, electrical and accessories repairs specialists, manufacturers of or dealers in electrical goods, etc. The permanent directors are:—E. Hammond, 37, Burnage Hall Road, Burnage, Manchester; and J. Flatley, 119, Tatton Street, Salford. Registered office: 65, Downing Street, Ardwick.

Scott & Martin, Ltd.—Private company. Registered September 30th. Capital £300 in £1 shares. Objects: To carry on the business of electricians, electrical and mechanical engineers, etc. The directors are:—J. Scott, 5, The Avenue, Hythe, Kent; and D. A. Martin, True Briton Hotel, Folkestone. Registered office: 5, The Avenue, Hythe, Kent.

Returns of Electrical Companies

Palestine Electric Corporation, Ltd.—Particulars of debenture stock for £300,000 and a premium of 2 per cent. on redemption at the option of the company otherwise than out of the sinking fund at any time on or before June 30th, 1941, and of 1 per cent. on similar redemption at any time thereafter on or before December 30th, 1966, authorised June 4th, 1931, and covered by trust deed dated August 6th, 1931, the amount of the present issue being £188,000. Property charged: In addition to properties in Palestine and Transjordania, the company specifically charged all its lands, tenements, real and immovable property in any other part of the world, and fixed plant and machinery thereon, and as a floating charge the company's undertaking and property, present and future, including uncalled capital (subject to trust deed and supplemental trust deed dated October 18th, 1928, and August 6th, 1931, respectively). Trustees: British Trusts Association, Ltd., 32, Bishopsgate, E.C.

Telephone and General Trust, Ltd.—Capital £1,300,000 in 550,000 preference, 450,000 preferred ordinary, and 300,000 ordinary shares of £1 each. Return dated March 12th, 1931. 294,437 preference, 427,000 preferred ordinary, and 300,000 ordinary shares taken up. £932,737 paid on 294,437 preference, 282,000 preferred ordinary, and 285,000 ordinary (including a premium of 5s. per share on the ordinary shares). £160,000 considered as paid on 145,000 preferred ordinary and 15,000 ordinary shares. Mortgages and charges: nil. Returns of allotments, made up to July 16th, 1931, show a further 251,601 preference shares allotted, payable in cash, and fully called up.

British Columbia Electric Railway Co., Ltd.—Capital £6,320,000 in £1,440,000 5 per cent. cumulative perpetual preference stock, £1,440,000 preferred ordinary stock, £2,406,103 deferred ordinary stock, and 1,033,897 unissued shares of £1. Return dated February 26th (filed March 30th), 1931. All preference, preferred ordinary and deferred ordinary stock taken up. £5,086,103 paid on the preference and preferred ordinary stock and £2,206,103 deferred ordinary stock. £200,000 considered as paid on £200,000 deferred ordinary stock. Mortgages and charges: £3,590,670.

Electrical and Radio Products (1931), Ltd.—Three mortgages for £12,000 in all dated August 13th, 1931, charged on freehold lands and cottages at Salfords, Horley, Surrey. Mortgagees: Portman Building Society, 14, Orchard Street, W. Conveyance dated September 7th, 1931, to secure all moneys, costs, charges and expenses which the chargee may become liable to pay under these mortgages. Holder: J. L. Gottlieb, 10, Hillcrest Avenue, Golders Green.

Eastern Electric Sound System, Ltd.—C. C. Murgatroyd, of 23, Park Row, Leeds, was appointed receiver on September 29th, under powers contained in a first mortgage debenture dated January 27th, 1931.

Sky Illuminations, Ltd.—Particulars filed of £1,500 debentures authorised September 16th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Powerplus (1927), Ltd.—Particulars filed of debentures for £5,000 and premium of 10 per cent. authorised September 28th, charged on the company's undertaking and property, present and future, including any uncalled capital, the amount of the present issue being £200.

Newcastle and District Electric Lighting Co., Ltd.—Capital £450,000 in £1 shares. Return dated April 3rd, 1931. All shares taken up. £450,000 paid. Mortgages and charges: £235,240.

Salisbury Electric Light and Supply Co., Ltd.—Capital £125,000 in £1 shares. Return dated March 31st (filed April 15th, 1931). All shares taken up. £122,500 paid. £2,500 considered as paid. Mortgages and charges: £15,700.

Crosby (Liverpool), Ltd.—Capital £500 in £1 shares. Return dated December 31st, 1930 (filed April 27th, 1931). 152 shares taken up. £2 paid. £150 considered as paid. Mortgages and charges: £500 debentures.

Telegraph Construction and Maintenance Co., Ltd.—Capital £896,400 in £12 shares. Return dated April 9th, 1931. All shares taken up. £448,200 paid. £448,200 considered as paid. Mortgages and charges: nil.

River Plate Electricity Co., Ltd.—Capital £625,000 in £150,000 preference stock and £475,000 ordinary stock. Return dated April 24th, 1931. All stock taken up. £112,447 paid on £50,000 preference and £62,447 ordinary stock. £512,553 considered as paid on £100,000 preference and £412,553 ordinary stock. Mortgages and charges: nil.

Waste Heat and Gas Electrical Generating Stations, Ltd.—Capital £350,000 in £1 shares. Return dated April 10th, 1931. 320,000 shares taken up. £320,000 paid. Mortgages and charges: nil.

Harmony, Ltd.—O. Berry, of 1, Queen Victoria Street, E.C.4, ceased to act as receiver and manager on September 23rd.

Allite, Ltd.—M. G. Chant, of 70a, Basinghall Street, E.C.2, ceased to act as receiver and manager on September 29th.

Dakol Electric, Ltd.—Sir Albert W. Wyon, of 3, Fredericks Place, Old Jewry, E.C.2, ceased to act as receiver on July 29th, pursuant to an Order of Court.

British Lumophon, Ltd.—Debenture dated September 23rd, 1931, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: L. M. Galansky, "Annadale," O'Keover Road, Broughton Park, Manchester, and others. Also second debenture of same date to secure £10,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: United Radio & Electrical Works, Ltd., 91, Great Russell Street, W.C.1.

Brompton & Kensington Electricity Supply Co., Ltd.—Capital £400,000 in 100,000 preference and 300,000 ordinary shares of £1 each. Return dated April 23rd, 1931. 6,705 preference and 373,193 ordinary shares taken up. £199,845 paid. £180,053 considered as paid. Mortgages and charges: nil.

English Electric Co., Ltd.—Capital £5,000,000 in 1,500,000 preference and 3,500,000 ordinary shares of £1. Return dated April 30th, 1931. 1,135,844 preference and 1,443,468 ordinary shares taken up. £902,614 10s. paid on 1¼ preference and 902,613 ordinary shares. £1,676,697 10s. considered as paid on 1,135,842¼ preference and 540,855 ordinary shares. Mortgages and charges: £1,096,636.

Normand Electrical Co., Ltd.—Capital £7,000 in £1 shares. Return dated September 9th, 1930 (filed May 8th, 1931). 6,015 shares taken up. £6,015 paid. Mortgages and charges: £1,000.

S. J. Jenkins, Ltd.—J. B. Sanderson, incorporated accountant, of Arcade Street, Ipswich, was appointed receiver and manager on September 14th, under powers contained in debentures dated March 16th, 1931.

Berkeley & Young, Ltd.—Satisfaction in full on February 27th, 1931, of debentures authorised February 16th, 1931, and registered February 27th, 1931, securing £10,000. (Notice filed September 23rd.)

Peterborough Electric Traction Co., Ltd.—Satisfaction in full on or before June 17th, 1931, of trust deed dated June 26th, 1903, securing £20,000 4½ per cent. debenture stock and an acknowledgment of indebtedness dated March 12th, 1907, in respect of £1,000 further stock and registered July 9th, 1903, and March 13th, 1907, respectively. (Notice filed September 23rd, 1931.)

Airedale Electrical and Manufacturing Co., Ltd.—Debenture dated September 18th, 1931, and as further security a mortgage of same date, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £1,500, charged (by debenture) on the company's undertaking and property, present and future, including uncalled capital and (by mortgage) lands and buildings at Bowling, Bradford.

J. G. Statter & Co., Ltd.—Debenture dated September 16th, 1931, to secure £5,000, charged on land at Amersham, and the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Wickford and District Electricity Supply Co., Ltd.—Capital £10,000 in 1,500 preference and 8,500 ordinary shares of £1 each. Return dated April 7th, 1931. All shares taken up. £9,995 paid. £5 considered as paid. Mortgages and charges, nil.

J.J.R., Ltd.—Capital £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Return dated October 15th, 1930 (filed May 7th, 1931). All shares taken up. £1,600 paid. £400 considered as paid. Mortgages and charges: nil.

Southwold Electricity Supply Co., Ltd.—Capital £30,000 in £1 shares. Return dated June 1st, 1931. 25,000 shares taken up. £8,500 paid. £16,500 considered as paid. Mortgages and charges: nil.

Keswick Electric Light Co., Ltd.—Capital £20,000 in 5,000 preference and 15,000 ordinary shares of £1 each. Return dated April 13th, 1931. 4,000 preference and 15,000 ordinary shares taken up. £13,000 paid on 13,000 ordinary shares. £6,000 considered as paid on 4,000 preference and 2,000 ordinary shares. Mortgages and charges: nil.

City of London Electric Lighting Co., Ltd.—Capital £2,400,000 in 400,000 6 per cent. first preference, 300,000 8 per cent. second preference, 1,600,000 ordinary, and 100,000 unclassified shares of £1 Return dated April 8th, 1931. 400,000 first preference, 300,000 second preference, and 1,200,000 ordinary shares taken up. £1,500,000 paid on the first and second preference and 800,000 ordinary shares. £400,000 considered as paid on 400,000 ordinary shares. Mortgages and charges: £996,740.

City Notes

Drake & Gorham, Ltd., in their report for the year ended June 30th last show a net profit of £3,242, as compared with £9,511 in the preceding year, to which is added £3,802 brought forward, making £12,044. The dividend is maintained at 5 per cent., general reserve receives £1,250, debenture stock issue expenses are written down by £1,250, and £3,294 is carried forward. The report states that the profit would have exceeded that of the previous year but for the fact that the Duro Co. did not comply with the terms agreed for the surrender of the agency. The settlement of this matter is still pending. The London Installation Department has been successful in obtaining a considerable share of the contracts placed in London, including a large generating plant for the Bank of England, and a similar equipment for the Prudential Assurance Co.'s offices in Holborn. Other contracts include South Africa House, Lewisham Town Hall, Onslow House, etc. The turnover at the Acton works has increased, and much attention has been devoted to the development of new lines, the benefit of which should accrue in future years. An issue of £60,000 5½ per cent. debenture stock was successfully made, in order to provide capital for the new works and retention money on large contracts. Meeting: October 30th.

The Potteries Electric Traction Co., in order to meet a heavy capital loss resulting from the abandonment of its tramways, proposes to reconstruct, and a scheme will be submitted to the shareholders on November 6th. The scheme provides for the reduction of the ordinary capital from £245,000 to £49,000, each of the ordinary shares being reduced from £1 to 4s. The preference capital will be reduced from £245,000 to £85,750 by writing off 13s. per £1 share, while the preferential rights as to dividends will be eliminated and arrears cancelled. The resulting shares will be consolidated into shares of £1, making with the unissued amount of £110,000, a nominal capital of £244,750. This will then be restored to the original amount of £600,000 by creating 355,250 ordinary shares of £1 each.

The American and Foreign Power Co. reports total operating revenues of its subsidiaries, for the year ended June 30th, at $73,578,434, as compared with $75,023,509 for the previous year. The net revenues were $37,548,878 (against $37,269,328). The income applicable to the Power Co. was $29,810,393, and after payment of dividends on the preferred stocks, there is a balance of $16,992,312, which is equal to more than $6 per share on all second preferred stock, series "A," outstanding on June 30th.

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary: Allied Electric Manufacturers, Ltd., Commercial Telephone & Electrical Co., Ltd., Harrison Bros. (Electrical Engineers), Ltd., Pinnacle Switchgear, Ltd., Siderman Electrical Supplies, Ltd., Thermo Electric, Ltd., Twiss Electric Transmission, Ltd.

Babcock & Wilcox, Ltd., have announced an interim dividend of 7 per cent., less tax, on the ordinary shares (against 7 per cent., tax free, for the corresponding period of last year).

The Madras Electric Supply Corporation, Ltd., has announced an interim dividend of 2½ per cent., tax free, on the ordinary shares. (Same.)

The Power Corporation of Canada has declared a dividend of 50 cents per share (same) on the common stock for the quarter ending October 31st.

Joseph Lucas, Ltd., report a net profit of £208,813 for the year ended August 7th, against £232,995 in the preceding eleven months. Reserve receives £25,702 (against £50,000), and it is proposed to pay a final ordinary dividend of 10 per cent., less tax, making 15 per cent. for the year (same), and to pay a bonus of 1s. per share, less tax, against 2s., less tax, last year. The amount carried forward is £59,889 (£36,961).

The Société Internationale d'Energie Hydro-Electrique ("Sidro") reports a profit of 60,163,016 fr. for the year ended June 30th, as compared with 83,462,873 fr. in the preceding year. The dividend is reduced from 28 to 6 per cent. and reserve receives 43,600,000 fr., leaving 218,459 fr. to be carried forward.

The Central Electricity Board has placed privately £1,000,000 of 5 per cent. stock, 1950-70. The stock will rank *pari passu* with the existing 5 per cent. issue, and a full six months' dividend will be paid on March 1st next.

The Anglo-American Telegraph Co., Ltd., has declared a quarterly dividend of 15s. per cent. on the ordinary stock, and £1 10s. per cent. on the preferred stock.

The Oriental Telephone and Electric Co., Ltd., has declared an interim ordinary dividend of 4 per cent., tax free (same).

Stocks and Shares

TUESDAY EVENING.

THE mood of the Stock Exchange markets, after changing from grave to nearly gay, fell upon a note of uncertainty. In nearly all departments a brighter tone came into evidence, due to the impression that the National Party will be returned to power with a substantial majority, and that the advent of a stable Government, taken in conjunction with devaluation of the £ sterling, will mean an all-round revival of British business. Trade reports from the principal centres of industry indicate that activity is already springing up. From one branch of industry after another, the cheery story comes of expanding business, increased orders, and healthy outlook. The approach of a General Election, upon the importance of whose result all the superlatives have been liberally besprinkled, has done something to check the animation of Stock Exchange markets. The regulation which enforces dealings as being only for cash is an influence which gives to either buying or selling a greater degree of force than it would obtain under conditions where no such restrictions were imposed.

Restoring the Balance

A fortnight ago, comment was made here on the unique character of the price-lists given overleaf, in that, for the first time this century, almost everything was lowered in price; in many cases substantially so. Recovery set in to a moderate extent last week, and in the current lists it will be seen that the upward movement has made further progress towards restoring the losses previously incurred. The outstanding feature is the manner in which Cables and Wireless stocks have advanced.

Cables and Wireless

The rises in Cables and Wireless stocks are attributed to a report, which bears reasonable appearance of verisimilitude, that the combine is doing very much better, and that its traffics are improving daily. The half-yearly dividend due on the preference stock last month was not met, but, according to the rumour just quoted, Cables and Wireless is now earning, not only its full preference dividend, but also sufficient money to permit of a small distribution on the "A" ordinary stock as well. The market is so limited that it requires the purchase of a comparatively few thousand pounds' worth of stock, in either of the three classes, to bring about abrupt advances, and it will be noticed that the stocks have gained rises ranging from 4½ to 6½ points. These are reflected in

the prices of Globe Telegraph and Trust shares of both descriptions, the ordinary and preference each being £1 better.

Great Northerns are 1 down at 21½, and Anglo-American Telegraph preferred stock at 94 shows a loss of 1½. Marconi Marines have spurted to 35s., being 3/16 up. The movement which departure from the gold standard brought about in stocks and shares carrying fixed-interest rates has not yet entirely spent its force, although in certain directions recovery has ensued from the recent lowest touched. For example, the 4½ per cent. debenture stock of the Central Electricity Authority at 89½ shows a gain of 2 points, and, to take another instance, British Electric Traction 5 per cent. perpetual debenture at 94½ is 2 better.

Home Railway Stocks

On the assumption that the Home Railway Companies will be amongst the first to benefit from the obvious revival in trade throughout the country, material advances have occurred in the list of Home Railway ordinary stocks. The trade lines are bound to gain, of course, by expansion of industry. The strength shown by this group was passed on, to a moderate extent, to the Undergrounds, where the feature is a rise of 4 points in Metropolitan consolidated ordinary to 39½. Underground ordinary hardened to 18s. 6d. Stocks of the other companies have not participated in the advance, though the prior-charge issues have come into request. London Electric 4 per cent. debenture stock has risen to 75½. On the other hand, Metropolitan 3½ per cent. preference at 56 shows a loss of 2 points.

London and Suburban Traction preference shares have shed 1s. 9d., the price going back to 8s. 3d. London United Tramways 4 per cent. debenture remains at 60½. A fall of 50 points lowered British Electric Traction deferred ordinary stock to 600, and the preferred ordinary stock, at 105, continues dull after its fall of last week.

Electricity Supply Shares

In this group the changes are of little consequence. Chelsea ordinary at 26s. and Brompton ordinary at 27s. 6d. are both 1s. down. Of the provincial shares, Lancashire Light and Power are a little better at 23s. 9d. Midland Electric Power at 26s. 3d. are ex dividend. Outside these, Whitehall Electric preference at 21s. 6d. show a gain of 6d.

Manufacturing and Equipment Shares

As may well be supposed, there are useful rises amongst the shares in the manufacturing and equipment companies. Associated Electrical Industries ordinary, which fell to 19s. 6d. last week, are now 21s. 3d., and G.E.C. ordinary, which dipped below 40s., have recovered to 43s. 9d. The principal rise is one of 50s. in Telegraph Constructions, the shares improving to 14½. Last month the price dipped, at one time, to a single figure. Henleys have put on 5s. at 5¾, Enfield ¼ at 3¾. Callenders are 1/16 better at 2 13/16, and British Aluminium gained a similar fraction at 28s. 9d. To illustrate the manner in which speculative shares are being sought, it may be mentioned that the ordinary and preference shares of the English Electric Company, which were both standing at 5s., have been raised to 7s. 6d. each.

Babcock & Wilcox have declared an interim dividend at the rate of 7 per cent., less tax, as against 7 per cent. free of tax a year ago. The announcement led at first to a decline in the price, but this was more than recovered, and at 51s. 3d. the shares are 1/16 up on the week. Shares in the iron, coal and steel companies are mostly strong. Vickers reached 10s. before reacting a few pence.

Flatness in Mexicans

Matters in Mexico seem to go from bad to worse, and prices of the stocks and shares in companies connected with the country appear to have lost what few friends they previously had. One day there will be, of course, a change for the better in Mexico, but meanwhile the bonds and shares of Mexican utility companies are in the doldrums. Mexican Light & Power preference fell 18¾ points last week, and this week the company's 5 per cent. first mortgage bonds are 7½ down. Mexican Electric 5 per cent. bonds are 12½ lower at 45, and Pachuca 5 per cent. first mortgage bonds 15½ at 33. Business has been marked this week in the latter at 30. In the Brazilian group, Tractions at 11¾ are 1¾ better. Some of the Rio and San Paulo utility bonds have secured small gains. In the Anglo-Argentine Tramways sterling issues, the company's 4½ per cent. debenture has dropped to 30.

Dollar Stocks

New York is faced with financial difficulties, although not to the same extent, of course, as are most of the other cities of the world. A few of the American utilities are a little better. Consolidated Gas of Baltimore have risen to 93½. Pennsylvania Water shares at 72½ are 7½ points higher, making a gain of 17½ within a fortnight. American Telephone and Telegraph has rallied 10 points to 175: Internationals at 22½ are 3 higher. Amongst Canadians, Winnipeg Electric mortgage stock at 55 shows a fall of 12½. Power Corporation of Canada at 42½ are 2½ up, after being 45½. Amongst miscellaneous movements, a rise of 5 points in Adelaide 5½ per cent. redeemable consolidated debentures to 80 reflects the more comfortable feeling now current in regard to Australian investments as a whole.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Oct. 13, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	£1	15	15	58/9	—	5 2 2
Brompton Ordinary	1	8½	8½	27/6	−1/-	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	80½	+2	5 0 6
Charing Cross Ordinary	1	8½	8½	29/0	—	4 16 7
Chelsea	1	8½	8½	26/-	−1/-	5 7 8
City of London	1	10	10	35/-	—	5 14 3
Clyde Valley	1	8	8	31/3	—	5 2 4
County of London	1	11	11	43/3	—	5 1 9
Edmundsons' 7% Pref.	1	7	7	24/6	—	5 14 3
Elec. Supply Corporation	1	11	11	42/6	—	5 3 6
Kensington Ordinary	1	8	8	29/-	—	4 16 7
Lancs. Light and Power	1	7	6½	23/9	+3d.	5 9 2
London & Home Counties 4½% Deb.	Stock	—	—	87½	—	5 2 10
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	37/6	—	5 6 8
Midland Counties	1	6½	7	26 3xd	−10d.	5 6 8
Mid. Elec. Power	1	15	8	26/3	−10d.	6 2 0
Newcastle-on-Tyne Ordinary	1	6	6	22/-	—	5 9 1
Do. 7% Pref.	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	1	8	8	29/-	—	4 16 7
Scottish Power	1	8	8	27/-	—	5 18 6
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	27/6	—	5 1 10
Westminster Ordinary	1	8½	8½	28/-	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/6	+6d.	6 19 6
Yorkshire Elec.	1	8	8	31/3	—	5 2 5

Home Rails

Central London Ord. Assented	Stock	4	4	70½	−1	5 13 6
Metropolitan	,,	4	3½	39½	+4	8 17 3
Do. District	,,	5	—	57½	—	8 13 10
Underground Electric	1	8	8	18/6	—	8 13 0

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	94	−1½	6 7 4
Do. Def.	,,	1½	1½	23	—	6 10 5
Cables & Wireless 5½% Pref.	Stock	5½	5½	50	+6½	—
Do. A 7½% Ord.	,,	Nil	—	10½	+6½	—
Do. B Ord.	,,	Nil	—	12½	+4½	—
Globe Tel. and T. Ord.	10	10	8½	7	+1	—
Do. do. Pref.	10	6	6	7½	+1	8 5 6
Great Northern Tel.	10	20	20	21½	−1	9 6 0
Marconi-Marine	1	15	15	35/-	−⅛	8 11 6
Oriental Telephone Ord.	1	12	12	2½	—	*5 12 11

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	5½	—	7/6	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	11½	—	—
British Electric Traction Def. Ord.	,,	5	5	600	−50	—
Do. do. Pref. Ord.	,,	8	8	105	—	7 12 5
Brazil Traction	100	8	—	11¾	+1¾	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	90½	+½	5 10 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	−1/9	—
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	25	—	20 0 0
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	35	—	20 0 0
Do. 1st Bonds	—	5	5	45	−7½	11 2 2
Victoria Falls Ord.	1	15	15	58/9	−⅛	5 2 2
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	1⅛	+1/9	5 13 0
Do. Pref.	1	8	8	26/3	+⅛	6 2 0
Babcock & Wilcox	1	15	14	51/3	+⅛	*5 9 3
British Aluminium Ord.	1	10	10	28 9	+⅛	6 19 2
British Insulated Ord.	1	15	15	2½	—	5 4 4
Brush Ord.	Stock	10	5	55	—	9 1 10
Callenders	1	15	15	2⅞	+⅛	5 6 8
Do. 6½% Pref.	1	6½	6½	21/3	—	6 2 4
Crompton Parkinson Ord.	5/-	30	30	22/6	—	6 13 4
Do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23,3	+6d.	6 9 0
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	5	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	¼	+½	6 9 0
English Electric	1	Nil	Nil	7/6	+½	—
Do. do. Pref.	1	Nil	Nil	7 6	+½	—
Ferranti Pref.	1	7	7	20/-	—	7 0 0
G.E.C. Pref.	1	6½	6½	23/-	+6d.	5 13 1
Do. Ord.	1	14	10	43/9	+4/3	4 11 2
Henley	1	30	30	5½	+¼	5 4 4
Do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Phillips	1	10	10	27/6	—	7 5 6
Siemens Ord.	1	7½	7½	23/9	—	6 6 0
Telegraph Construction	12	10	7½	14½	+2½	6 4 0

* Dividends paid free of Income Tax.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Charges to the Isolated Consumer

"When are you going to bring a cable out to my place?" This inquiry came from a farmer who lives outside the village nearly half a mile from our nearest main. Besides the farm, the only other possible customers are a group of eight poor class cottages. The total expenditure will be £285. I do not want to over-estimate the probable annual revenue, so will allow £12 for the farm, and I will assume that we get six out of the eight cottages at an average of £2 per annum, making a total revenue of £24, which is only 8½ per cent. on the outlay. Capital charges alone (interest and repayment) come to 7½ per cent., so that obviously it is not a profitable investment.

Rightly or wrongly my committee looks for a 20 per cent. return on extensions, although needless to say we do not always get it. The £24 revenue on a 20 per cent. basis would warrant an expenditure of only £120; this leaves £165, which I will describe as unsecured capital. Will the farmer make an initial payment of this amount for the privilege of having electricity? With last year's hop-crop unsold he certainly will not. The Electricity Acts provide for a 20 per cent. guarantee, that is £57 per annum, for three years. Will he give this guarantee? No, he will not. To ask for it will give the impression that electricity is a very expensive luxury. What then is to be done if the capital charges on the £165 unsecured capital at 7 per cent. come to £11 10s.? Ask for a rental charge of £10 per annum with electricity at the usual district rate? This seems to be the only method likely to be successful.

It is obvious that an addition of 10 or even 20 per cent. to the usual rates for electricity would not meet the case; moreover, the rental charge is likely to go on indefinitely. "But," he will say, "supposing someone else builds, will he share my rental charge or will my rental charge be reduced?" The rental charge certainly should be reduced, but very likely it will be impossible to pass any of it over to the newcomer. Therefore, the arrangement should be "for each £1 by which the revenue from this extension exceeds 10 per cent. of the outlay, the rental charge shall be reduced by 7s." This means that if the revenue increases owing either to new property or increased use by the first customers the rental charge will be reduced in proportion and will disappear altogether if and when the revenue reaches 20 per cent. of the total outlay.

Will he accept these terms? I think so, because I shall give him a guarantee that with lighting only at normal rates his bill will not exceed £16 per annum including rental charge. This will be less than a private plant would cost him and he will have the option of buying more kWh for power, cooking, water heating, &c., at a lower rate than he could get with his own plant. If he accepts will it be successful? Yes, because he will have every inducement to use more to reduce the rental charge and to persuade all his cottagers to have electricity installed.

I shall not ask for an agreement and guarantors. People do not like to be worried—just an ordinary letter agreeing to our terms will be sufficient. But supposing he dies or leaves the farm? Then the situation will have to be explained to the new tenant, who with the light there, ready to switch on, will continue to use it and pay the rental charge or possibly buy it out. Risky business? Maybe, but life is full of risks and the business of the supply engineer is to sell the electricity and just make both ends meet.

H. WILSON,
Electrical Engineer, Ashford U.D.C.

Ashford, Kent, *October 8th*, 1931.

The Electric Drive in Factories

I have just read the article by Mr. W. P. Conly in this week's issue of the ELECTRICAL REVIEW, and I am surprised that the author should have seen fit to show the crude-oil enigne in such unfavourable colours.

Taking his electrical figures as being correct, provided that electricity is obtainable at 1½d. per kWh, no allowance is made for the purchase price of electricity for lighting purposes, which might be quite 4d. per kWh. In a big factory the lighting bill at 4d. per kWh is a very high percentage of the power bill.

He also states that a 70 b.h.p. oil engine complete, and fixed, will cost at least £1,250. He must have obtained his data in 1923, as we are sure that any of the best makers would deliver and fix a 70-h.p. engine for very nearly half this figure, at to-day's ruling prices. We specialise in oil engines and enjoy comparisons, but we feel that when such comparisons are made, it is only fair that the figures should be as accurate as possible.

C. C. MACBRIDE,
pp. Power Machinery Trading Co.

Hampton, Middlesex, *October 10th*, 1931.

Engineering Trade in China

I was very much interested in Professor Middleton Smith's article in the ELECTRICAL REVIEW of October 9th, and I feel just as keenly as he does regarding the apathy of English engineering manufacturers.

It seems to me that no interest is taken in the Eastern market at all.

I came over to England seven years ago to study electrical engineering in order to qualify for a position in China as representative for some English company.

In my enthusiasm I thought that manufacturers in this country, aware of the huge market for their goods in China, would at least interest themselves in the appointment as Eastern representative of a Britisher born and educated in Shanghai but trained as an engineer at an English University and works.

I know better now, and have yet to find such a firm. However, I have not given up hope.

Being British, I did not find any difficulty in entering a works for practical experience. I had a Chinese friend, however, who (because of his nationality, I suppose) found it impossible to do likewise and eventually had to give it up as a bad job and return home in disgust.

CHINA-BRED BRITISHER.

October 10th, 1931.

Electricity *v.* Oil for Heating

Perhaps better times are now in view for the electrical industry in general, and the temporary decrease in the value of the £ may prove a help. To take one instance alone: electricity has had in oil a strong adversary in large heating installations, chiefly on the ground of lower running costs. In cases where electricity can show equivalent costs (and in many cases even now this can be done owing to the advantages which modern electric heating equipment possesses) there is no doubt as to which will come out on top. With the decrease in the value of the £, however, it would seem that an increase in the price of oil to the consumer in this country must inevitably result, and those who now have oil-burning installations have the prospect of this increase before them, plus the possibility of a tariff. Against this, electricity remains a falling market, based as it is on British coal, the price of which should still tend to go down with the increased output. Now, therefore, is the time for the electrical industry to make a strong effort to capture the large amount of heating work that will be done, and so help themselves, the British miner and, incidentally, the country.

BASTIAN & ALLEN, LTD.

London, N.1, *October 9th*, 1931.

Irregular Voltage?

In a small shop which I frequently enter, I noticed the other day that the brilliance of the light seemed to indicate that the rating of the lamps was about 20 to 30 volts below that required by the system pressure. I was told that lamp failures were frequent even during the summer months.

If it were possible to obtain some authoritative figures relating the number of lamps used and their burning hours with the actual voltages at consumers' terminals it would enable responsibility for lamp failures to be fixed, either on the local supply conditions or on the design of lamp.

The question of lamp failures is an important one when weighing up the claims of an undertaking to give a cheap and efficient supply.

C. F. BLADE.

Pitsea, Essex, *October 8th*, 1931.

Appointments in Ireland

In the issue of your journal for October 2nd the Civil Service Commission of Ireland advertise vacancies for probationary assistant engineers. They do not advertise the fact that these appointments are open only to Irish born persons, Irish citizens, or children of Irish citizens, but it may interest your readers to know that these conditions are printed on their list of regulations.

The conditions in the Civil Service of Great Britain are that candidates for an appointment shall be natural born British subjects of natural born British parents, but not necessarily English.

ENGLISHMAN.

October 6th, 1931.

Always Advancing!

In the Final Report of the First Census of Production of the United Kingdom (1907) on page 830 we find "Section XIV.—Public Utility Services." It commences: "The following section deals with gas, water, and electricity undertakings. . . ."

Will the compilers of the 1924 Census Final Reports allow electricity to "step up one" according to its merits on value of output?

Public Utility Services.	Final Report (1907) Value of Output. £		Preliminary Report (1924) Value of Output. £
Gas	30,645,000	Gas	64,224,000
Water	10,434,000	Electricity	37,329,000
Electricity	8,735,000	Water	20,296,000

How long is it going to take for electricity to "step up one" again?

EXCELSIOR.

October 7th, 1931.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

8,092. "Arrangements for modulating radiation, particularly for use in picture-telegraphy, television, telephony by beams of light, and talking pictures." C. Mueller. March 12th, 1930. (357,191.)

11,786. "Electrical resistances." Dr. S. Just. September 16th, 1929. (357,122.)

13,374. "Current transformers." W. W. Triggs (Ohio Brass Co.). May 6th, 1930. (357,082.)

14,089. "Wave signalling systems." G. Priechenfried and J. Robinson. May 7th, 1930. (357,085.)

14,579. "Electric circuit-breakers." British Thomson-Houston Co., Ltd., H. Trencham and H. C. Heath. May 12th, 1930. (357,198.)

17,413. "Control device for vehicles with internal-combustion engines and electrical transmission by means of direct-current generator, especially for Diesel-electric vehicles." Maschinenfabrik Oerlikon. November 2nd, 1929. (357,089.)

17,572. "Automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd. (W. Hatton, R. D. Spann, E. J. Rousseau, and F. O. V. Larson). June 6th, 1930. (357,091.)

17,643. "Polyphase commutator machines." A. H. Heyland. June 6th, 1930. (357,092.)

17,741. "X-ray apparatus." O. H. Peiper. June 7th, 1930. (357,093.)

17,869. "Wireless and like electrical apparatus." Paragon Rubber Manufacturing Co., Ltd., and G. W. Croot. June 10th, 1930. (357,171.)

17,975. "High-potential transformers." Koch und Sterzel Akt.-Ges. July 29th, 1929. (Addition to 11208/30.) (357,208.)

18,031. "Lamp galleries for holding lighting-fittings without screws." J. S. W. Bartley. June 12th, 1930. (Cognate application 20382/30.) (357,095.)

18,037. "Electrostatic condensers for wireless apparatus." General Electric Co., Ltd., W. A. C. Maskel, and N. J. McAinsh. June 12th, 1930. (357,096.)

18,095. "Pupin coil-boxes." Siemens und Halske Akt.-Ges. July 6th, 1929. (357,209.)

18,158. "Switching on electric wave signal transmission systems." Standard Telephones and Cables, Ltd., S. H. Grove and K. G. Hodgson. June 13th, 1930. (357,134.)

18,189. "Arrangements for measuring electrical potential differences or functioning in accordance therewith." Associated Electrical Industries, Ltd. June 13th, 1929. (357,174.)

18,268. "Electrical control systems for elevators, hoists, and the like." T. R. Warren, G. D. Smith, and Associated Electrical Industries, Ltd. June 14th, 1930. (357,176.)

18,358. "Television and the like." J. H. O. Harries. June 16th, 1930. (357,143.)

18,359. "Photo-telegraphy and the like." J. H. O. Harries. June 16th, 1930. (357,144.)

18,419. "Drum-type motor-operated switchgear for electric motors." International General Electric Co., Inc. June 14th, 1929. (357,217.)

18,433. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. June 16th, 1930. (357,153.)

18,603. "Apparatus for preventing the withdrawal of current from the mains side of a consumer's current meter." G. De Frescheville. June 18th, 1929. (357,221.)

18,613. "Electric signalling systems." Automatic Telephone Manufacturing Co., Ltd., and T. R. Rayner. June 18th, 1930. (357,222.)

18,634. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. June 21st, 1929. (357,225.)

18,651. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and C. E. Beale. June 18th, 1930. (357,185.)

18,652. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Caswell. June 18th, 1930. (357,186.)

18,700. "Alternating-current transmission systems." Standard Telephones and Cables, Ltd., E. K. Sandeman, R. L. Hughes, P. R. Thomas, and C. R. Dunham. June 19th, 1930. (357,228.)

18,701. "Terminal shield for submarine cables." Standard Telephones and Cables, Ltd., and A. D. Blumlein. June 19th, 1930. (357,229.)

18,702. "Loud speakers." Standard Telephones and Cables, Ltd., and R. W. Hardisty. June 19th, 1930. (357,230.)

18,703. "Electron-discharge devices." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). June 19th, 1930. (357,231.)

18,704. "Circuit arrangements for automatic or semi-automatic telephone exchange system." Standard Telephones and Cables, Ltd. (Bell Telephone Manufacturing Co., Soc. Anon). June 19th, 1930. (357,232.)

18,706. "Piezo-electric crystal mounting." Standard Telephones and Cables, Ltd. August 14th, 1929. (357,233.)

18,707. "Electromagnetic relays." Standard Telephones and Cables, Ltd., and R. S. G. Terry. June 19th, 1930. (Addition to 324,075.) (357,234.)

18,708. "Manufacture of multi-conductor electric cables." Standard Telephones and Cables, Ltd. September 11th, 1929. (357,235.)

18,709. "Cable-forming machines." Standard Telephones and Cables, Ltd. August 30th, 1929. (357,236.)

18,805. "Cord circuit-repeaters." Standard Telephones and Cables, Ltd., L. P. Lowry and C. G. Connolly. June 20th, 1930. (Addition to 29846/29.) (357,241.)

18,851. "Thermionic valve circuits for generating high-frequency currents." Graham Amplion, Ltd., and A. D'A. Hodgson. June 20th, 1930. (357,244.)

18,894. "Electromagnetic sound-recording and sound-reproducing apparatus." P. W. Willans and H. E. Holman. June 20th, 1930. (357,248.)

18,993. "Electric lamps." A. Lederer. June 25th, 1929. (357,252.)

19,476. "Electrolytic electricity meters." A. West and Co., Ltd., and W. A. Childs. June 26th, 1930. (357,268.)

19,640. "A.c. induction electricity meters." F. Holden and Measurement, Ltd. June 27th, 1930. (357,273.)

19,934. "Push-pull thermionic amplifier." Hazeltine Corporation. July 16th, 1929. (357,286.)

19,966. "Electric circuit-breakers." British Thomson-Houston Co., Ltd. July 1st, 1929. (357,287.)

20,564. "Automatic telephone exchanges." Telefonaktiebolaget L.M. Ericsson and K. Larsson. July 7th, 1930. (357,301.)

20,662. "Push-pull thermionic amplifiers." Hazeltine Corporation. Aug. 17th, 1929. (357,306.)

20,724. "Direct current arc-welding apparatus." J. B. Hansell and Associated Electrical Industries, Ltd. July 8th, 1930. (357,308.)

21,015. "Light-sensitive device for generating electric currents." R. Audubert. July 11th, 1930. (357,312.)

22,496. "Electrical switchgear." D. R. Davies and Associated Electrical Industries, Ltd. July 25th, 1930. (357,324.)

22,999. "Electromagnetic sound warning or signalling apparatus." H. A. Gill (E. A. Laboratories, Inc.) July 30th, 1930. (357,331.)

24,708. "Systems of reception for modulated wave telegraphy and telephony." E. Y. Robinson and Associated Electrical Industries, Ltd. Aug. 18th, 1930. (357,345.)

24,924. "Electrical measuring-instruments." Evershed and Vignoles, Ltd., C. F. Baker and S. F. W. Finnis. Aug. 20th, 1930. (357,347.)

25,383. "Beacon lights for air traffic." J. Pintsch Akt.-Ges. Aug. 24th, 1929. (357,351.)

25,853. "Machines for inserting contact pins in the bases of radio tubes or the like." Westinghouse Lamp Co. Aug. 31st, 1929. (357,353.)

26,928. "Electrical connecting-devices." W. T. Henley's Telegraph Works Co., Ltd., and R. G. Gray. Sept. 9th, 1930. (357,362.)

28,254. "Automatic electric circuit breakers." Voigt und Haeffner Akt.-Ges. May 8th, 1930. (357,369.)

29,330. "Telegraphones." V. Poulsen. Oct. 1st, 1929. (357,378.)

29,524. "Anti-fading receivers employing thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. Oct. 15th, 1929. (357,379.)

29,897. "Electric vacuum-cleaners." O. Bresges and O. Offerman. May 14th, 1930. (357,384.)

30,160. "Electric remote-control systems." British Thomson-Houston Co., Ltd. Oct. 8th, 1929. (357,388.)

30,296. "Electrical burglar alarm systems." S. Bucher. Oct. 22nd, 1929. (357,389.)

32,197. "Magnetos capable of functioning in battery ignition circuits." Soc. Anon. Pour l'Equipement Electrique des Véhicules. Dec. 26th, 1929. (357,402.)

33,903. "Electrical control of movable knives employed in pile-cutting machines, and control of operations relating thereto." Havannah Mills Co., Ltd., and G. Roger, Jun. Nov. 11th, 1930. (357,412.)

35,977. "Thermo-couples for use in measuring temperatures." British Thomson-Houston Co., Ltd. Nov. 12th, 1929. (357,413.)

34,124. "Thermal electric meters." L. A. Paine. Nov. 12th, 1930. (357,416.)

35,089. "Electric motor control systems." Westinghouse Electric and Manufacturing Co. Nov. 21st, 1929. (357,421.)

35,838. "Alarm-clock electric switches." G. Duguid. Nov. 28th, 1930. (357,429.)

37,547. "Electric time-switches particularly for X-ray apparatus." British Thomson-Houston Co., Ltd. June 23rd, 1930. (357,439.)

38,174. "Electron-discharge tubes or thermionic valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 19th, 1930. (357,444.)

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861. "Suspension device for electric transmission lines." S. Salvi. July 21st, 1930. (357,456.)

5,801. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. Feb. 24th, 1930. (357,475.)

12,197. "Arrangements for producing modulated high-frequency oscillations." Telefunken Ges. für Drahtlose Telegraphie. April 28th, 1930. (357,479.)

13,281. "Antennæ for wireless signalling apparatus." Soc. Francaise Radio-Electrique. May 6th, 1930. (357,480.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 7th:—

Tufflinto. No. 525,568. Class 1. Case-hardening compounds. —G.W.B. Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.7.

No Name. No. 520,311. Class 13. Electric lamps (ordinary). —Joseph Weinbaum, trading as the Stormlight Incandescent Electrical Co., 160-164, Mile End Road, E.1.

Hercoplug. No. 525,096. Class 50. Wall plugs made principally of vegetable fibre.—H. J. Eck, trading as Justus Eck, 10, Priory Road, Bedford Park, W.4.

The E.A.W.

On September 21st the Birmingham and Midlands Branch of the E.A.W. resumed activities. A general meeting in the afternoon was followed by the Faraday Commemorative meeting in the evening. On October 7th Mr. J. A. Cooper, B.Sc., of the British Broadcasting Corporation, gave an address on "The Development of Broadcasting to 1931."

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Avonmouth.—Extensions to premises in the docks for Rowlands Bros. & Co., Ltd.

Barking.—Houses (51), Thornhill Gardens; I. Leftley. Boiler house, Abbey Match works, and pavilion, Rover Road; J. John Masters, Ltd. Estate development, Alfred's Way estate; Suburban Developments (London), Ltd. Factory, Alfred's Way; Scoffin & Willmott. Offices and extensions, Jenkins Lane; Gross, Sherwood & Heald, Ltd. Offices and shops, East Street; Messrs. Glenny. Shops (17), Lodge Avenue; L.C.C. architect. Shops (14) and garages, Longbridge Road; Hooker & Rodgers. Extensions, Tangent works, Abbey Road; Stanley Waghorn.

Bedford.—Houses (24) for the R.D.C.; Beaumont & Taylor.

Bicester.—Housing scheme for the U.D.C.; H. T. Smith, surveyor.

Blackpool.—Block for the Municipal School, Highfield Road, South Shore, for the T.C. (£24,532); Atherton Bros., builders, Peter Street Saw Mills.

Bognor Regis (SUSSEX).—Telephone exchange, Pagham, for H.M. Office of Works, King Charles Street, London, S.W.

Bolton.—Houses (477), Hall-in-Wood estate, and clearance schemes, Barlow Row and Green Street areas; borough engineer.

Bournemouth.—Hotel, shops and flats, Bourne Avenue, for Richmond Chambers, Ltd. Shops, Richmond Hill, for R. Ives.

Bradford.—Houses (722), Rodesway & Allerton Road, and shopping centre, Thornton Road; J. Atkinson Jowett.

Bristol.—Houses (700) and dressing accommodation at The Downs (£5,000); city engineer.

Buntingford (HERTS).—Houses (18) for the R.D.C.

Cheltenham.—Church; trustees, Highbury Congregational Church.

Chesterfield.—Houses (46), Newbridge Lane (£16,043); G. Rowley, Birmingham. Alterations and additions, printing works, Wheeldon Lane; Brayshaw & Bateman. Alterations to White & Sons' premises, High Street, Duncan, Gilmour & Co., Ltd.

Clydebank.—Houses (470), North Kilbowie; burgh surveyor.

Doncaster.—Boys' grammar school (480 places), for the borough E.C.; director of education. Aerodrome (£12,500) for the T.C.

Dumbarton.—Houses (222) for the C.C.; architect, County Council Chambers.

Dundee.—Extensions to Church of St. Margaret's, Barnhill (£4,000), with electric lighting installation; T. Lindsay Gray, architect. Church for trustees of the U.F. Church of Scotland, Caird Avenue; the minister.

Eastleigh.—Reconstruction of cinema; Pitcher Construction Co., Ltd., builders.

Edinburgh.—Reconstruction of premises for John Croall & Sons, Ltd., Castle Terrace; T. F. Maclennan, architect, 7, South Charlotte Street.

Essex.—Combined treatment centre, Laindon, for the county E.C.; J. Stuart, county architect, Chelmsford.

Ewhurst (nr. Hastings).—Installation of electricity, Sogg's House; Miss Frances Beadle.

Farnham.—Development of Chantry estate, Alton Road, for S. Bide & Sons; R. W. Cass. Alterations, 48-9, The Borough; Timothy Whites, Ltd.

Felling-on-Tyne.—Alteration to the Station Hotel; S. H. Lawson, architect, Emerson Chambers, Newcastle.

Glass Houghton (YORKS).—St. Paul's Church; R. A. Easdale & Son, architects, County Chambers, Castleford.

Gillingham (KENT).—Business premises, High Street, Rainham, for the T.C.; J. L. Redfern, borough engineer.

Gravesend.—Workshops and garages, Bentley Street; E. W. Filkins.

Guildford.—Printing works, Martyr Road, for Guildford Printers' factory, Cemetery Road, for the Co-operative Society, Ltd.; secretary.

Haslingden.—Covered market, Bury Road (£8,000); borough surveyor.

Hertford.—Houses (97), Horns Mill site, for the T.C.; borough surveyor.

Hertfordshire.—School, Bushey, for the county E.C.; county architect, Hatfield. Additions to Leyland Street schools (£8,213) for the R.D.C.; J. H. Wilson & Sons.

Hull.—Houses (43), Huntley Drive; A. H. Evans & Co., Ltd. Houses (36), Kirklands Road; H. Johnson. Houses (20), Lodge Street; J. E. Barnet. Eight shops, Beverley High Street; Atkinson & Overton.

Irish Free State (CORK).—Restaurant building for the Irish Industrial Fair Committee; B. O'Flynn, architect, 60, South Mall. (TULLAMORE, KING'S CO.).—Medical and surgical hospital (100 beds) for the County Board of Health. (MAYO).—Conversion of county gaol into a hospital having 100 beds (£50,000); County Board of Health.

Kettering.—Additions to works, for S. T. Patrick, Union Street; Smith & Bunning, builders, Regent Street.

London (CAMBERWELL).—Buildings, 442-4, Old Kent Road; G. L. Russell. (EAST HAM).—Tuberculosis pavilion, Harts Sanatorium (£10,500), and nursery block, Aldersbrook Children's Homes, for the T.C.; borough engineer. (LEYTON).—Flats, with electrical work and automatic electric lifts, for the T.C.; borough surveyor.

Long Benton.—Houses (100) at Forest Hall for the U.D.C.; W. Bean, surveyor.

Monkseaton (NORTHUMBERLAND).—Church for the Newcastle Presbytery.

Morpeth.—Installation of electric lighting in 40 houses at Widdrington Station for the R.D.C.; R. Carse & Sons, builders, Oldgate.

Mutford (SUFFOLK).—Houses (176) for the R.D.C.

Nelson.—Houses (23); borough surveyor.

Newbiggin (NORTHUMBERLAND).—Houses (50) for the U.D.C.; Mr. Kailofer, surveyor.

Newcastle-on-Tyne.—Houses (32) and flats at Cowgate; F. Dryden, architect, Market Street. Church at High Heaton for the Newcastle Presbytery. Showrooms, Prudhoe Street; T. Y. Payne, architect, Emerson Chambers. School at Cowgate for the E.C. (£50,000); J. Craven, builder, Westgate Road.

Northampton.—Public buildings (£250,000); J. C. Prestwich & Sons, architects, Leigh.

Norwich.—Cinema, All Saints' Green; O. Bond, architect.

Nuneaton.—Branch premises, Stockingford, of the Nuneaton Co-operative Society, Abbey Street; A. Watkins & Sons, builders, Riversley Road, Chilvers Coton.

Oxford.—Houses (38), Abingdon Road (£16,106); E. Cotton & Son, Iver Heath. Senior school, Temple Cowley (£17,350); Woolridge & Simpson, Ltd.

Perthshire.—Improvements and alterations to public hall for Kingussie T.C. (£1,360). Mr. Chisholm, architect, Inverness.

Peterborough.—Bazaar premises, Bridge Street, for Marks & Spencer, Ltd., London.

Plymouth.—Alterations, 2, Athenæum Terrace; General Accident Assurance Corporation, Ltd. Alterations and additions, Nazareth House, Durnford Street; sisters of Nazareth. Showrooms and garage, 76, Cobourg Road; Reeds (Plymouth), Ltd.

Portsmouth.—Houses (71), Westwood Road; R. J. Winnicott. Labour exchange, Anglesea Road; H.M. Office of Works. Shop and showrooms, 117-9, Commercial Road; Landport Drapery Bazaar, Ltd. Transport depôt, Copnor; city engineer.

Preston.—Public baths; borough surveyor. Schools, Holme Slack, Greenlands estate, Fishwick; director of education.

Rotherham.—Extensions to grocery department of the Rotherham Co-operative Society, Ltd., Effingham Street; building department, C.W.S., Broughton Lane, Manchester.

Shoreham-by-Sea (SUSSEX).—Development of Buckingham Park estate for residences, for Mr. Middleton; Stanley Towse, architect.

Smethwick.—Extensions to Bridge Street works; J. A. Phillips & Co., Ltd. Alterations, Old Wesleyan Chapel, New Street; S. J. Tyler & Sons, Ltd.

South Shields.—Wiring of houses (236), Tyne Dock for the T.C.; J. Barron, general contractor, Burns Street, Jarrow. Alterations to the Empire Theatre, King Street; Hudson & Sons, builders, Sunderland. Houses (£60,039), Dock estate; A. Elcoat, Bearpark, Durham.

Stirling.—Cinema, 2,300 seats (£25,000); Bailie Neil Hamilton, architect, Paisley.

Stockport.—Cinema and café, Mersey Square; William Thornley and trade contractors.

Stourbridge.—Houses (186), Forge Hill estate; borough engineer.

Thirsk.—Houses (100) for the T.C.; surveyor.

Wakefield.—Junior school, Dewsbury Road; Canon Leteux.

Walsall.—Tuberculosis block, Goscote Hospital (£14,600); borough engineer. Iron foundry, Hatherton Lane, for the Vulcan Foundry, Ltd., Pleck Road; secretary.

West Hartlepool.—Houses (100), Rift House estate, for the T.C.; F. Durkin, borough engineer, Municipal Buildings.

Weymouth.—Electricity showrooms, etc., for the T.C.; Crickmay & Sons, architects. Alterations, St. Mary's schools; S. Jackson & Sons.

Wiltshire.—Extensions, Nurses' block, Harnwood Hospital, Salisbury, for the T.C.; T. Walker, county architect, Trowbridge.

Workington (CUMBERLAND).—Church and schools, Vulcan's Lane; Henry Oldfield, architect, 1, John Street.

Worsborough (YORKS).—Houses (44), Birdwell, for the U.D.C.; surveyor.

Cyclorama Lighting at the Westminster Theatre

The above theatre, which was formerly the St. James's Picture House, Palace Street, Westminster, S.W., has been transformed into a luxurious repertory theatre. A special stage has been constructed, complete with a modern plaster cyclorama, which marks a new step in cyclorama lighting.

Unlike various Continental systems of cyclorama, which necessitate the use of seven different shades of colour, this new method employs only red, blue, and green. By varying the intensity of these three colours upon the cyclorama plaster face it is possible to obtain any particular hue. This is largely due to the dimming apparatus, the individual units of which are wound by a method devised by Messrs. C. Harold Ridge and S. F. Aldred, the consulting engineers for the Shakespeare Memorial Theatre. The equipment for lighting the cyclorama consists of a double bank of Strand Electric "Sunray" battens at the top, whilst horizon lighting is obtained by means of a double bank of specially constructed "Sunray" magazine ground rows. The acting area, when the cyclorama is being used, is illuminated by four Strand Electric 1,000-W spot lanterns, concealed in the roof of the auditorium, whilst side lighting is obtained by means of two 1,000-W spots concealed in the architecture on the right and left-hand sides of the auditorium, and within 15 ft of the stage. The proscenium batten is installed for interior scenes, and this consists of a "Sunray" magazine batten with two 1,000-W spot lanterns mounted in the centre.

The Strand Electric & Engineering Co., Ltd., has also been responsible for the whole of the electric lighting work of the building, whilst an associated company, the Strand & Interchangeable Sign Co., has supplied the neon and interchangeable signs mounted on the exterior.